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In this issue . . .

Uncle Sam and his Latin American Neighbours	153
Stockpiles and Foreign Aid	155
Iron Ore Project in India	157
Off-Shore Survey of Cornwall	157
Black Coal Industry of Australia's Eastern States	159
Joint U.S.-Dominican Project	159
Correspondence	159
Mining Technology in 1960	160
Implications of Radioisotopes to the Mining Industry	163
Large Scale Strip Mining Operations in the United States	166
Mining Miscellany	167
Machinery and Equipment	168
Metals and Minerals	171
London Metal and Ore Prices	171
Mining Finance	174
Obituary : James D. Wolff	176
Company Meeting	176

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Uncle Sam and his Latin American Neighbours

UNTIL Castro became President of Cuba, the South American Republics were not among the major recipients of foreign aid. Indeed it could be said, broadly speaking, that, where Western interests were not directly imperilled, they have been allowed to work out their own economic and political destinies with minimum interference from outside sources. U.S. outlays to the 21 nations comprising Latin America, though far from insignificant, have amounted to less than 5 per cent of the $90,000,000,000 or so handed out by Uncle Sam since the end of the war in the form of loans, grants and surplus commodity transactions throughout the world. Moreover, some $2,500,000,000 of the $4,500,000,000 which Latin America has received since 1945 in U.S. aid has been in the form of loans and guarantees from the Export-Import Bank.

Now that the change of government in Cuba has given the Communist *bloc*, as it were, a toehold in the American continent, the United States is becoming increasingly conscious that the Latin American countries with their desperately low living standards and their extreme inequalities of wealth are potentially the weakest bastions of Western democracy. These conditions are conducive not only to political instability but also to the growing demands for expropriation, nationalization or "Mexicanization" of foreign-owned firms, among which are great smelting and mining concerns such as those of Kennecott and Anaconda in Chile. Unfortunately there is no reason to believe that for the majority of the Latin American countries substantial economic development is as yet in sight.

While recognizing the urgent need for a massive injection of dollars into Latin America, the Kennedy Administration is determined that the flow of U.S. aid shall not be swallowed without trace in the deserts of privilege and waste, leaving a few thousand people richer than ever and the rest no better off. President Kennedy seeks, therefore in his "Alliance for Progress" to link future aid to a programme of planned economic growth, redistribution of land, and tax reform. The Latin American countries, on their part, while prepared to accept dollars in the name of progress, are apt to be unreceptive to other people's ideas of how they should organize their own affairs. In particular, they are allergic to any proposals which they regard as tending to relegate them indefinitely to the role of producers of raw materials for the industrial nations, but this does not prevent them from attaching the utmost importance to stable markets and prices for those primary commodities which are the mainstays of their economies at the present time.

The Inter-American Economic Conference, which opened at Punte del Este near Montevideo on August 7, might be described as an all-out attempt to accelerate Latin American development based on self-help by the recipients of foreign aid supplemented by a truly immense programme of financial and technical assistance.

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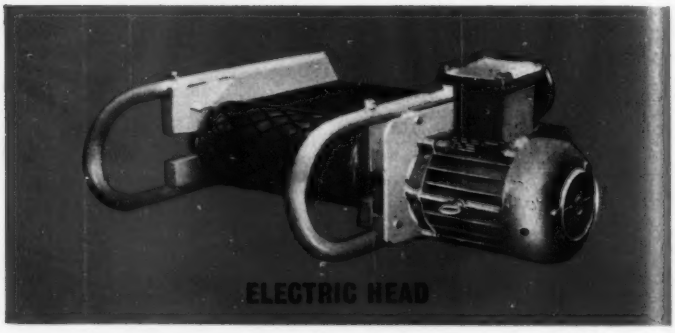

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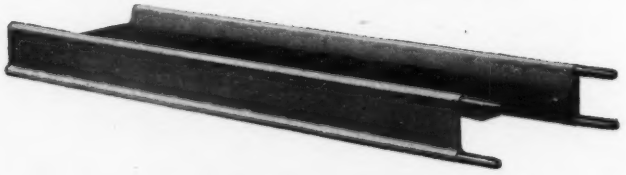

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While it would be premature at this stage to herald the conference as a major landmark in the history of the subcontinent, its initial outcome could scarcely have been more encouraging. The draft declaration, which at the time of writing has yet to be formally signed, commits the United States to pumping $20,000,000,000 into South America during this decade, most of it consisting of public funds. This is actually as much as the Latin American countries themselves had asked for or anticipated. America itself is expected to provide roughly half this amount and by a happy coincidence, a vote by the U.S. Senate in favour of the Foreign Aid Bill came during the closing stages of the conference. This Bill, if approved by Congress, will give President Kennedy authority to withdraw $8,800,000,000 directly from the Treasury over five years for low-interest development loans to relatively under-developed nations, thereby enabling the U.S. government to enter into long-term commitments such as the Latin American aid programme with confidence.

It is expected that some $300,000,000 annually will be supplied by European countries and Japan and a similar amount by U.S. private investors and international agencies such as the World Bank.

The draft agreement—sponsored by Argentina, Brazil, Chile, Mexico and Peru—also proposes that the Inter-American Development Bank should be the Central Agency for assessing the various national projects and the channelling of the necessary funds. The Bank would be assisted by technical agencies, which in turn would mobilize experts for advice and supervision. Latin American countries are called on to start immediately on long-term blue prints and produce them within eighteen months.

The decisions taken will provide immediate aid from U.S. contingency funds for projects submitted within sixty days. Among the probable beneficiaries are the Bolivian tin mines, from whom requests for money to buy capital equipment are already under consideration in Washington.

A notable feature of the conference was a firm promise by the U.S. to participate far more intimately in international arrangements aimed at stabilizing the world prices of the commodities on which Latin American countries are heavily dependent for employment and foreign exchange, among which may be instanced copper, lead, tin and zinc, as well as a number of agricultural products. Early in the proceedings Chile's Treasury Minister, Sr. Eduardo Figuero, referred to the impact of prices on the Chilean copper industry and said that, as long as no agreement was reached to stabilize raw material prices, some compensatory mechanism should be established for losses arising from sharp fluctuations in market prices. U.S. reaction to this particular statement has not been reported. However, as commented upon elsewhere in this issue (page 174-5), Mr. Douglas Dillon, U.S. Secretary of the Treasury, told the Conference that the U.S. was prepared to enter the International Tin Agreement and that it planned to discuss with the Tin Council at an early date the terms of its possible accession thereto.

The U.S. has also pledged strong support for a Latin American "common market", which would merge the two loose trade groupings already set up by the South American and Central American countries respectively (*vide The Mining Journal*, May 22, 1959, pp. 551 and 552).

The Punte del Este conference, with its emphasis on social and economic progress conceived, co-ordinated and financed on a scale which promises to rival that of the Marshall Plan, will give a renewed impetus to the development of Latin America's rich mineral wealth, much of which in all probability has yet to be discovered, and to the expansion of mine and smelter facilities. The outlook, therefore, is for a steadily rising demand for mining machinery, ore treatment plant and associated equipment, as well as for the many other types of equipment required for road, railway and harbour construction. Having regard to the dominant part which the American dollar has played in opening up the major mining fields and to its future role in financing the lion's share of the envisaged programme as well as to the increasing activity of German and Japanese manufacturers in these regions, it is evident that South and Central America will be highly competitive markets for mining machinery exporters. Nevertheless the opportunities provided by this huge area of developing countries, with an assured capital contribution from external sources of at least $20,000,000,000 in the next ten years, could be rewarding indeed to British exporters who are prepared to spend time and money on first-hand investigation.

STOCKPILES AND FOREIGN AID

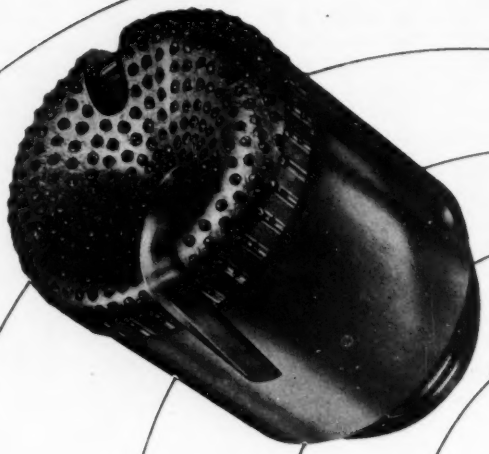
Among the proposals made in the Bill to implement President Kennedy's proposed five-year programme of foreign aid was one which would permit the Administration to withdraw "excess" metals from the National, Supplemental and Defence Production Act stockpiles and allocate them to the nations needing such raw materials in lieu of cash "grants".

Section 609 of the Foreign Aid Bill would have authorized transfers, without charge, of materials in the national and supplemental stockpiles or the Defence Production Act inventories for use in the aid programme. Each plan of transfer was to become effective sixty days after its submission to Congress unless Congress disapproved it.

U.S. government experts were reported to be enthusiastic about the section, which from a purely administrative standpoint has superficial attractions, having regard to the high cost of looking after the nation's huge stockpiles, more especially when it is considered that in many instances the strategic importance of the accumulated materials has been diminished by the advent of hydrogen bombs and guided missiles.

There are, however, other and far more important considerations than any potential benefits to the taxpayer's pocket and these were effectively set out by Mr. Julian Conover, executive vice-president, American Mining Congress, in a letter sent to each member of the Senate Foreign Relations Committee. A full explanation of the harmful effect of Section 609 was also made to each member of the Foreign Affairs Committee of the House. The letter pointed out that, in the original Stockpiling Act of 1946, Congress adopted the policy that materials in the stockpiles should be held as a reserve for purposes of national defence, and that in disposing of any materials which were determined to be in excess of requirements, special precautions should be taken to protect producers, processors and consumers against disruption of their usual markets. It was laid down in the Act that no disposal of stockpile materials should be made until after six months' notice, nor (except in the case of obsolescence) without express approval by Congress.

"Congress clearly recognized," wrote Mr. Conover, "that the existence of these large stockpiles of metals, minerals and other materials, unless carefully safeguarded by such provisions, would be a constant threat to commercial markets and would seriously hamper normal planning and expansion in the producing, processing and consuming industries." Enactment of section 609, it was stated, would be prejudicial and dangerous to the domestic mining industry and to the whole structure of Free-World metal and mineral markets. By providing a mechanism under which large-scale disposals of stockpile materials could be made, without adequate review by the affected industries and by Congress, it would throw confusion and uncertainty into



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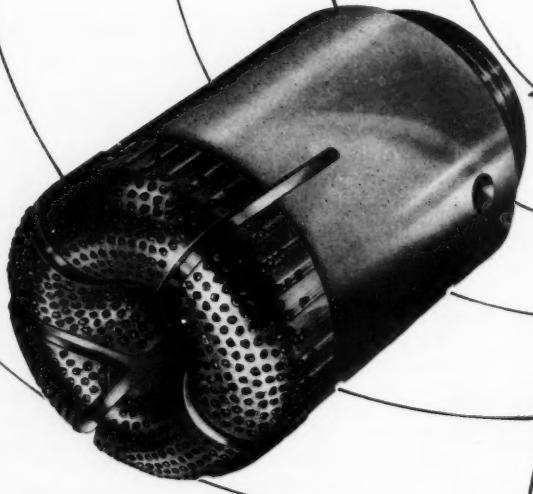

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many of the nation's important metal and mineral industries, hanging over them like a "Sword of Damocles" which might fall at any time. In the case of metals such as lead and zinc, which are already seriously depressed, it would compound the present difficult situation.

To these most pertinent comments it might well have been added that, so far as the recipients of U.S. foreign aid are concerned, the proposed measure would be in the nature of robbing Peter to pay Paul, since aid granted to some underdeveloped countries in the form of metals or minerals released from the stockpiles would, in effect, be given at the expense of countries producing the materials in question, some of which are also receiving large sums from the U.S. government in the form of loans or grants.

Happily, this rather Gilbertian situation is no longer liable to arise, for the Senate Foreign Relations Committee, cognisant of the harmful effects of Section 609, has deleted it from the Bill, and its example has been followed by the House Foreign Affairs Committee. It would appear, therefore, that this particular bogey has been conclusively laid.

IRON ORE PROJECT IN INDIA

The Indian Government has accepted in principle the Rs. 410,000,000 scheme of the Orissa Government for the development of the iron belt of Paradip and Sukhinda in Cuttack district, according to Mr. Bijoyanand Patnaik, the state's Chief Minister. Mr. Patnaik said that the project was not included in the Third Five-Year Plan. Financing of this project would, therefore have to be done in consultation with the Central Government. He was also expecting some foreign collaboration in the implementation of this project.

It was further stated that Government would be able to export about 2,000,000 tons of iron ore through Paradip port by 1965, and the figure would go up to 7,000,000 tons by 1970. The Minister added that, besides the development of the iron ore belt, the State Government also proposed to set up a chain of small blast furnaces in the area to produce pig iron for export purposes. When developed, Paradip port would be one of the biggest ore loading ports in the country.

The Rs.10-crore Kiriburu Iron Ore Project of the National Mineral Development Corporation is already eight months behind schedule. The initial operation of the mines, which was to begin in December 1962, is likely to be delayed by a whole year, reports our Indian Correspondent. The reasons for the delay are said to be over-centralisation and routing of purchases through the Director-General of Supplies and Disposals. The NMDC has now decided not to make its purchases through the D.G.S. & D.

According to the time-schedule agreed between the Corporation and its Japanese consultants, the project report was to be accepted by April 1960 and the selection of equipment made by December. The NMDC accepted the project report in May — one month behind schedule — but the selection of machinery was delayed because the experts and consultants did not have powers to make the selection. Since Japan has granted a loan of 8,000,000 yen, and machinery has to come from Japan on the advice of Japanese consultants, the Indian and Japanese experts of NMDC could have made the selection, it is said. Under the circumstances, it is feared that the necessary machinery may take many more months to arrive because the Japanese suppliers and shippers may take their own time to manufacture the machinery and deliver it. They have warned already that they should not be held responsible for the delay.

The Kiriburu Project was the first to be entrusted to the NMDC. Under an agreement with Japan, the project should supply 2,000,000 tons of iron ore to that country for a period of 10 years, commencing from January 1964. The project, which was considered uneconomic by the Union Government from the start, was nevertheless, taken in hand in order to earn the much needed foreign exchange.

OFF-SHORE SURVEY OF CORNWALL

The latest airborne geophysical survey being carried out over the western English Channel and the sea area south west of the Bristol Channel by Hunting Surveys Ltd. for the D.S.I.R. will be linked to previous airborne magnetometer surveys of Cornwall and Devonshire and will contribute to data obtained by land survey and off-shore surveying using boats and divers. In particular it will tie in with a land survey in the area carried out by a team sent by Durham University in 1950, with an off-shore mapping project carried out by a Bristol University team using an inclined echo sounder and, more recently, with an off-shore survey of two square miles in the vicinity of St. Agnes and Perranporth made by a team of six divers led by Mr. R. H. T. Garnett with the financial support of the Imperial College Exploration Board.

While geophysical methods of exploration will provide data concerning the depth of water, sediment and the configuration of the rock, details of the tonnage, distribution, grade and positioning of the economic minerals within the sediment can only be obtained by drilling, coring, dredging and diving. Lode and seam deposits present more serious problems and underground development from adjoining land must be examined. The outcome of land, airborne and sea exploration may well throw up areas that could prove worthwhile prospecting since they will plot the shape of the granite batholith at depth, a factor which is important in the localisation of mineralisation. Secondly, the airborne magnetometer surveys should locate promising areas for closer off-shore investigation using survey boats equipped with geophysical instruments and carrying divers. Detailed geophysical mapping of the sea bed can be made to determine the petrology, minor structures, and degree of metamorphosis of the country rocks into which the granite has been intruded. (See *The Mining Journal*, Feb. 17, p.182, Feb. 24, p.208 and March 3, p.239.)

Hunting Surveys will fly about 14,000 line miles of magnetic profile this season. The data obtained will be reduced for the production of total magnetic intensity maps at a scale of 1 inch to 1 mile. The whole of the area of the survey is being covered by a grid of parallel flight lines flown north-south and spaced two kilometres apart. Tie-lines spaced ten kilometres apart are flown east-west, and control lines at fifty kilometres cover the whole area and are continued across the peninsular to provide a complete closed control network joining the sea areas to the north and south of the land mass. But as Mr. Garnett points out in his paper on "Offshore mineral exploration" (see the *Chartered Surveyor*, Jan. 1961) only part of the 1390 sq. miles of Cornwall plus the additional offshore area of 440 sq. miles (included by a 2 mile limit for diving) is worthy of mineral exploration, since most of it is outside the present known area of mineralisation. Thus the area meriting off-shore investigation is confined to that west of a line drawn through Newquay and Truro and extended to the south coast. The area of the land surface to the west of this line, excluding the Scilly Isles is approximately 440 sq. miles. Enclosed between the low water mark and a two mile outer limit is a total area of 240 sq. miles. Thus by including the off-shore areas the total prospecting ground in West Cornwall is increased by 55 per cent.

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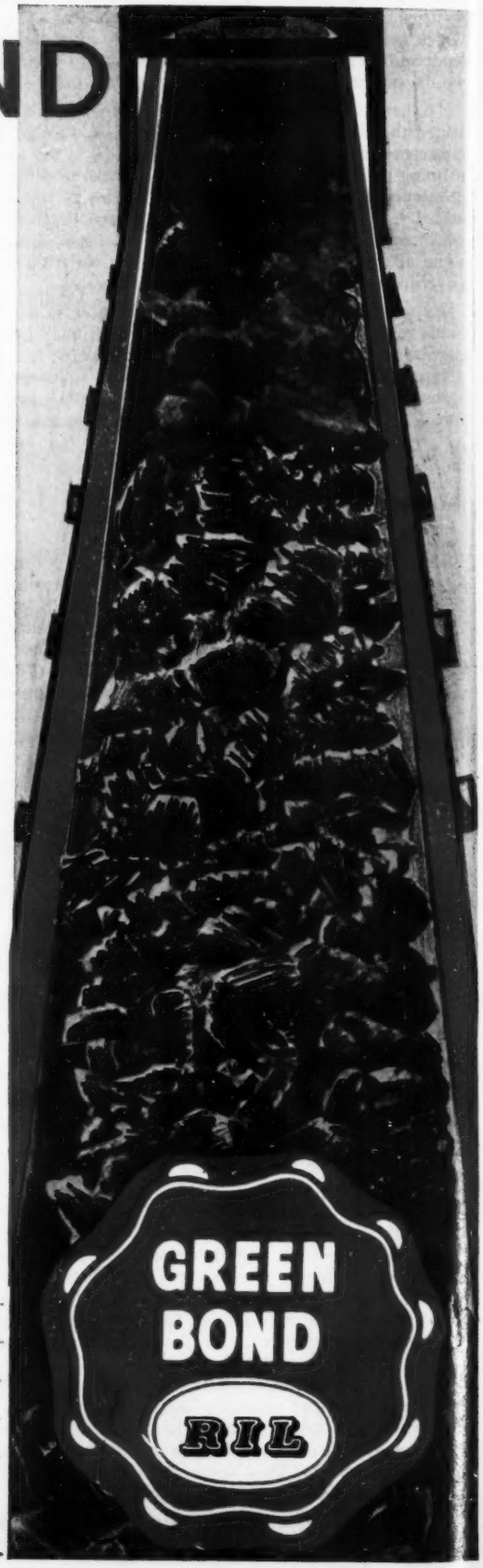

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Diamond drilling could be used off-shore to explore the sea bed but not only would this be expensive but it would not indicate whether lodes were worth mining. The average lodes in the area are about 18 inches wide with veins of cassiterite about 2 inches wide. The only practical method is to develop seawards through existing mine workings. In this connection Geevor mining engineers will attempt to seal off the breach in the sea bed with concrete this summer in preparation for the dewatering of the mine.

BLACK COAL INDUSTRY OF AUSTRALIA'S EASTERN STATES

Under the stimulus of anticipated Japanese coal trade, the black coal industry of New South Wales and Queensland is developing rapidly. New South Wales production has been greatly advanced by exports to Japan, but there has been marked increase in domestic consumption, despite the competition by oil. An important factor in consumption is the erection of thermal electric power stations on the coalfields, with direct delivery from mine to boiler house.

A big obstacle to coal export has been, and is, the lack of coal loading facilities and harbour improvements to meet the requirements of the 40,000 ton colliers being built for the overseas trade. This position is being met and the lag overtaken. Loading facilities at Newcastle and Balmain are to be brought up to date, and an off-shore loading plant is to be built at the Coalcliffe Colliery. Rio Tinto is negotiating to buy a group of collieries in the Burragorang Valley.

Queensland is building a substantial export trade based on the open cut mines being developed at Callide, Kianga and Moura. It is expected that export trade will reach a total of 5,000,000 tons within five years, resulting from the planned harbour and loading improvements, which include deepening Newcastle harbour by 11 ft. to accommodate the colliers now being built. The situation can be said to have arisen from the rapid mechanisation and increased colliery efficiency, with resulting rise in output, and demand overtaking port installations that have lagged behind the general position.

JOINT U.S.-DOMINICAN PROJECT

An agreement has been signed between the Dominican Republic government and the Chicago firm of Meissner Engineers Inc. for the establishment of a major mining and metal producing enterprise, with 51 per cent of the assets owned by the Dominican State.

The investment in capital equipment will be in the region of $60,000,000 and will include a railway and a new port at Punta Gorda. The first stage will be the exploitation of the large iron ore deposits in the Provinces of Sanchez Ramirez and Duarte. It is estimated that an annual production figure of 5,000,000 tons of ore will be achieved soon after shipments commence in 18 months' time and it is possible that this may be doubled three years from that date. The annual income derived from these developments for the Dominican Republic government is estimated as being not less than $25,000,000, which will probably rise to a considerably larger figure.

The enterprise plans to establish an iron and steel industry in the near future which will produce steel sheet and constructional materials. Work on mining and transport installations will commence before the end of the year and will employ 3,000 workers which will also be the number of permanent workers needed by the industry. Arrangements are being made to train Dominican technicians at the University of Santo Domingo with assistance from the Massachusetts Institute of Technology.

A United Nations technical expert working in the Dominican Republic, Dr. Carl Stresino, has stated that the Dominican Republic is one of the richest areas in the world for minerals including manganese, nickel, cobalt, chrome, molybdenum, zinc, bauxite and possibly petrol.

CORRESPONDENCE

Need For An Inquiry Into Tin Reserves

The Editor,
The Mining Journal.

Sir.—The final removal by the International Tin Council of export quotas on tin, during the latter part of 1960, uncovered the fact, which many had not realised, that production was lagging well behind consumption in the Free World. In recent months many and varied expressions of opinions, some by mining folk authoritative in their respective fields, have given rise to confusion of appreciation of the Free World reserves position.

At the present time opinions of producers and consumers alike, on the short and long term position of tin supplies, are uncertain. This uncertainty is contrary to the interests of further tin developments from either the consumers' or producers' point of view.

The International Tin Council has now an obligation to the world tin industry, to take some acceptable positive step to clarify the position. It is is within the Council's powers under the International Tin Agreement to sponsor a thorough inquiry into the world's potential reserves and long term production possibilities.

Perhaps the normal procedure would be to undertake such an enquiry through the various government representatives on the Council, each referring back to his government for report. But pursued in that way, the information might well be subject to the innumerable pressures inherent in such a method; in addition, an invaluable standardization of quality of observation and thread of continuity and singleness of enquiry as between countries would be lacking, My mind goes back to the enquiry which my old colleague, Sir Lewis Fermor, made in Malaya in the 1930s.

I would suggest that the time is opportune for the council to appoint a small committee to undertake such an inquiry It should consist of not more than two members, each widely knowledgable of the tin industry, and capable of assessing the potential reserves and production possibilities in the main producing countries; their complete neutrality as between the main tin producing countries would be essential.

The committee should visit the main producing countries —Malaya, Indonesia, Thailand, Burma, Congo and Ruanda Urundi, Nigeria, and Bolivia. The compilation of the evidence which the committee may deem necessary could probably be completed at no great cost. The committee's report would provide an invaluable basis on which the industry—producers and consumers—could build for the future.

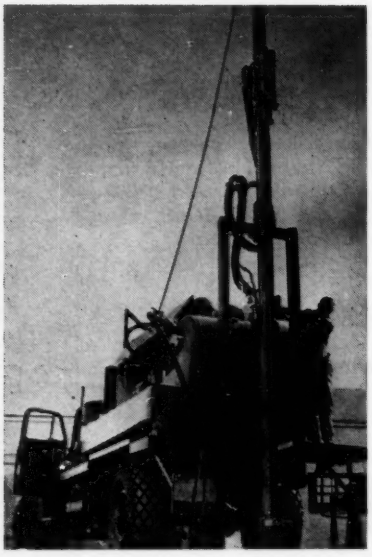
Is it too much to suggest that the International Tin Council may see its way to sponsoring such an investigation at this most critical stage in tin's history ?

29 Turnbull Avenue,
Toorak,
Victoria,
Australia.

Yours etc.,

J. A. Dunn.

Mining Technology in 1960



At left, alongside, the Joy mobile seismic-air 400 rig

At right, centre this page, a 1,600 h.p. electric wheel truck by R.G. Le Tourneau carrying 75 ton load at Anaconda's Berkeley Pit

Bottom opposite page, Richard Sutcliffe Ltd. hold sole British manufacturing rights for a high angle conveyor system developed in Germany

A CYCLIC pattern of behaviour is common in nature and to many human activities. Mining technology tends to exhibit this same behaviour pattern. Unfortunately, cyclic development introduces imbalance into the technology of mine production. One phase of production operation often enters a period of intense interest and development; as a result some other phase lags behind, eventually forming a bottleneck in the total operational process. This, apparently, is true at the present time.

Immediately before and during World War II, mine transport was a subject of investigation and improvement. So-called trackless mining was introduced and improvements were made in truck, conveyor, and track haulage. Following World War II and continuing to the present time, drilling entered a period of rapid development with the introduction of tungsten carbide bits, more general use of jumbos, and new types of drills such as the air-leg and down-the-hole. Within the past 5 years blasting has been the subject of intense investigation, and new types of explosives and blasting techniques have been introduced. Today the technologics of ground control and mine transport, outdistanced by other phases of mine technology, are beginning to receive more attention because their relative backwardness tends to retard production.

Exploration, Transport, Drilling

Selection of targets for mineral exploration is being based more and more on indirect rather than direct evidence of orebodies. The circumstances forcing this action will accentuate rather than de-emphasize the trend. The 1960 Jackling lecture by L. B. Slichter emphasized the need for a new philosophy of prospecting. The lecturer postulated the importance of statistical analysis to bulwark experience and judgement in appraising expectations of finding ore. Such analysis, more definitive relationships of tectonic pattern and geologic structure to favourable ore deposition, and improved physical tools for exploration are needed to select target areas and conduct exploration.

Development workings in underground mines are designed primarily to accommodate a transportation system. Once the workings are established, the transportation system becomes relatively inflexible. Moreover, as mining is extended the transportation system may become inadequate. Visits during the year to older metal-mining districts revealed that several mines have reached the point where development workings are either unsuitable or inadequate for modern transportation systems.

The petroleum industry is continuing an intensive drilling research programme from which the mining industry has already benefited. L. W. Ledgerwood, head of the drilling and development section, Jersey Production Research Co., stated that the industry has spent more than $25,000,000 in efforts to develop systems more economical than rotary drilling, with as much as $1,000,000 a year being spent on a single tool or development. The greatest effort has been directed to developing better drill bits, but research work

subjects range from the fundamentals of rock fragmentation to the relationship of drilling variables and individual items of drilling equipment. With a few exceptions past developments have been aimed at making equipment to implement preconceived ideas of drilling tools and systems, rather than just defining the most effective way to break rock and then building the needed system. Evolution of a satisfactory new drilling system, however, is a problem of research rather than development.

In an excellent résumé of efforts to develop new drilling systems, Ledgerwood lists and describes the major approaches to date. The list includes mention of magnetostriction, solenoid, eccentric weight, and airhammer under hammer-action drills. Other drilling actions described are pellet impact, shock wave, explosives, turbodrill, electrodrill, flame, arc, abrasive jet, chemical, and rocket exhaust.

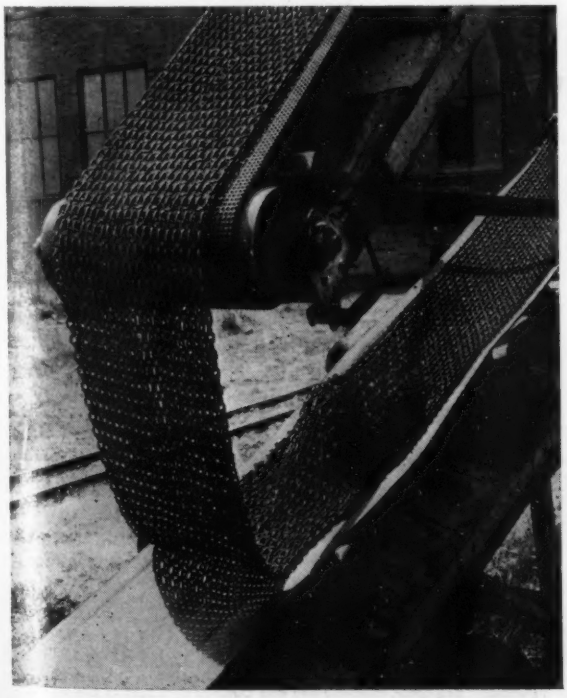
Interestingly, of all the possible methods of drilling holes in rock, the only new method applied to mining in recent years is flame or jet piercing. Ironically, the general principle is the same as the earliest known method of rock breaking in mining—fire setting. Meanwhile, the petroleum industry has been improving its drilling tools and adapting other such tools to its use. One is the air-gas hammer drill, similar to a down-the-hole drill, designed for drilling the harder formations met in oil well drilling. Starting with tests using a

in.-diameter machine to drill 7⅞-9in. holes, a 9in. machine was designed that has drilled 13¾-in. holes and is being tested on a 17½in. hole. Cone-type bits are used.

A study at the Mining Research Laboratory of the Colorado School of Mines on impact crater formation in rock provided significant data in the theoretical analysis of rock drilling. Essentially, the tests consisted of a projectile striking a target material and forming a crater. Sandstone and granite were the target materials. A close correlation was found between the shear strengths of rocks and their material constants. The material constant appeared to be inversely proportional to the specific acoustic resistance of the target material, the proportionality factor being dependent on the shape of the projectile.

Blasting and Prospecting

The development of modern blasting agents and current research problems in this field were outlined. With increased use of these agents and intensive research during the past few years on their composition and action, many of the parameters for optimum performance had been established. However, the relatively recent introduction of these agents for blasting and their rapidly increased use had not provided the background of experience normally essential for developing safe practices in using explosives. Field experiments were being made on blasting agents with various mixtures of ingredients, particularly the so-called slurry blasting agents. It appeared that the development and use of fertilizer-grade ammonium nitrate blasting agents had reached a plateau where most of the original advantages in cost and handling had been realized. Much of the current work on these agents was directed to improving performance, reliability, and safety. In pursuing this end, there was a tendency to introduce increased costs, standards of preparation, and detonating requirements, tending to bring the blasting agents into range of competition from other explosives. These factors indicated that future progress in use of blasting agents in mining probably would be at a slower but more stable rate.



This survey is abstracted from *Review of Mining Technology* by P. T. Allsman and J. E. Hill, which is a reprint from U.S. Bureau of Mines *Minerals Yearbook 1960*

Anticipating the new frontier in mining provided by ocean bottoms, the U.S. Navy had developed a vehicle for underwater prospecting. Dubbed RUM (remote underwater manipulator) the vehicle was essentially a remote-controlled tank with a long, jointed, manipulator arm and hand, together with an underwater television camera serving as eyes.

Various types of conveyors are important in transport systems for bulk material and have not been given the consideration they deserve in metal mining. One drawback has been the limit of inclination (about 20 deg. maximum for most materials). A new development, the sandwich conveyor, is one solution for steep-angle belt transport. Essentially, the sandwich conveyor is a double belt device; one belt conveys the material, and the other runs on top of the material to hold it in place. Installations inclined as much as 45 deg. are possible. Another design uses a travelling chain instead of a top belt to hold the material in place.

Opencast Operations

Skip haulage in open pits was finding increased use as a component of a transport system providing efficient vertical movement of material. The present concept of inclined-skip hoisting in open pits was introduced in 1949 at the South Agnew mine in Minnesota. Subsequently, other installations were made in the iron mines of Minnesota and Canada and were followed by more recent use in western copper pits. The major advantages gained by inclined-skip haulage in open pits are the decrease in the length of haul and the stripping requirements associated with benching to a grade necessary for rail or truck haulage.

Attention was focused during the year on surface-mining equipment that combined the functions of excavating, loading, and transport. The equipment required specific favourable physical conditions of material and terrain for successful application but offered distinct advantages where these conditions prevailed. The bucket wheel excavator, patented in Germany in 1913, was first used in German lignite mines in 1920. Units have been developed with capacities ranging from 90 to 12,000 cu. yds. per hr. Introduced into strip coal mines in the United States, the device was being considered for other mining conditions. The combination of continuous-action equipment, such as wheel excavators and conveyors, produces exceptionally high capacity operation.

The newest development in truck haulage was the application of individually driven electric wheels. Stated advantages were greater manoeuvrability and rapid stopping. Originally developed for military use, the equipment had not been extensively field tested in the mines. The Anaconda Company currently was testing this type of equipment in its Berkeley Pit.

The mining industry is plagued with a problem common to the modern industrial complex, the need for systematic and speedy handling of data. Operating and management decisions must be made from analysis of voluminous data under conditions in which the allowable margin of error and time latitude is narrowing. Modern electronic computers and machine data processing can be used to advantage in some instances. Several companies used or experimented with these data processing techniques. *Engineering News Record* issued a special report on computers for engineering office practices to meet the growing interest in these machines.

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Implications of Radioisotopes to the Mining Industry

This paper by H. J. Rose, Pittsburgh, consultant, was presented at a conference on Radioisotopes in the Mining Industry held at Denver during April 13-14 this year and sponsored by the American Mining Congress and the Colorado School of Mines Research Foundation, Inc., in co-operation with the Office of Isotopes Development of the Atomic Energy Commission. The paper, of which the first of two instalments appears herewith, is presented in abridged form

RADIOISOTOPE techniques have important possibilities in mineral exploration, mining operations, and the processing and use of ores and minerals. Radioisotopes can be used for identification and measurement, for monitoring product quality, and in the automatic control of operations. They can also be used in connection with the handling and transportation of materials, in preventive maintenance, and for analysis and research.

Present Status

Constantly increasing economic pressures make it urgent for mining companies to consider new developments which offer substantial improvements or economies in operation. Radioisotopes are already being used in the mining industries to improve performance, to reduce costs and to provide new levels of process control and automation.

This is shown in an extensive report which the writer recently completed for the A.E.C. Office of Isotopes Development. The survey was concerned with potential uses of radioisotopes in the coal industry, and contained 110 numbered suggestions for the use of radioisotopes in the production, transportation and use of coal[1]. About 80 of these ideas are already in regular or experimental use somewhere in the world, for mining, industry or analogous uses.

About one-third of the 110 suggested applications are ready now for routine operating use by mining companies. The equipment can be used effectively and safely by present plant operators after instruction. Examples of such equipment are density gauges, level controls, recognition and counting devices, flow measurement, etc. They are also used to monitor operations for automatic measurement and control. The devices can be used on the outside of pipes, bins, etc., without contacting the materials being measured. Such radioisotope devices can be made rugged, reliable, and low in maintenance cost compared with non-nuclear devices for similar purposes.

Another one-third of the 110 potential applications are also ready for use, but for special studies or tests by technical personnel. These are used to improve mining and processing operations; to detect flaws, corrosion, deposits or wear; to measure the mixing of materials, to trace flows; and for analysis, research, etc. For such uses, nuclear-trained personnel (either employees or consultants) use readily available instruments and radioisotope techniques, plus their ingenuity and experience, to help solve special problems.

The remaining one-third of the 110 suggestions consist of proposed uses for radioisotopes, most of which appear to be technically feasible but which would probably require considerable research and development before the techniques are ready for regular industrial use. These include some potentially important applications which deserve prompt consideration.

The report just mentioned refers primarily to the coal industry, but a majority of the suggestions can also be applied to the metal mining and mineral industries. Furthermore, these industries have many other unique possibilities for radioisotope applications. A check list of existing and potential applications of radioisotopes in the mining industry was also prepared by the writer[2].

Advantages

Some of the advantages of using radioisotopes are :

1. *Sensitivity.* The radiations emitted by radioisotopes can be detected with great sensitivity, and can be identified, measured and recorded. In this way, smaller amounts of materials can be detected than by any other method. For example, the rate of wear of lubricated metal parts during a short period of time, can be measured from the minute traces of metals appearing in the lubricant.

2. *Penetrating Properties of Radiation.* The radiations from radioisotopes pass through liquids and solids in varying degrees, the absorption depending on the nature of the radiation itself, and on the characteristics of the sample being penetrated. This permits the measurement of thickness, density internal flaws, corrosion or deposits, etc. The ability of gamma-rays to penetrate opaque containers and to make measurements on the contents without contacting them, is an important advantage.

Such radiations are similar to X-rays, and often compete with them for the radiography of fabricated metal parts, where the portability and low cost of radioisotope gamma-ray sources are important advantages.

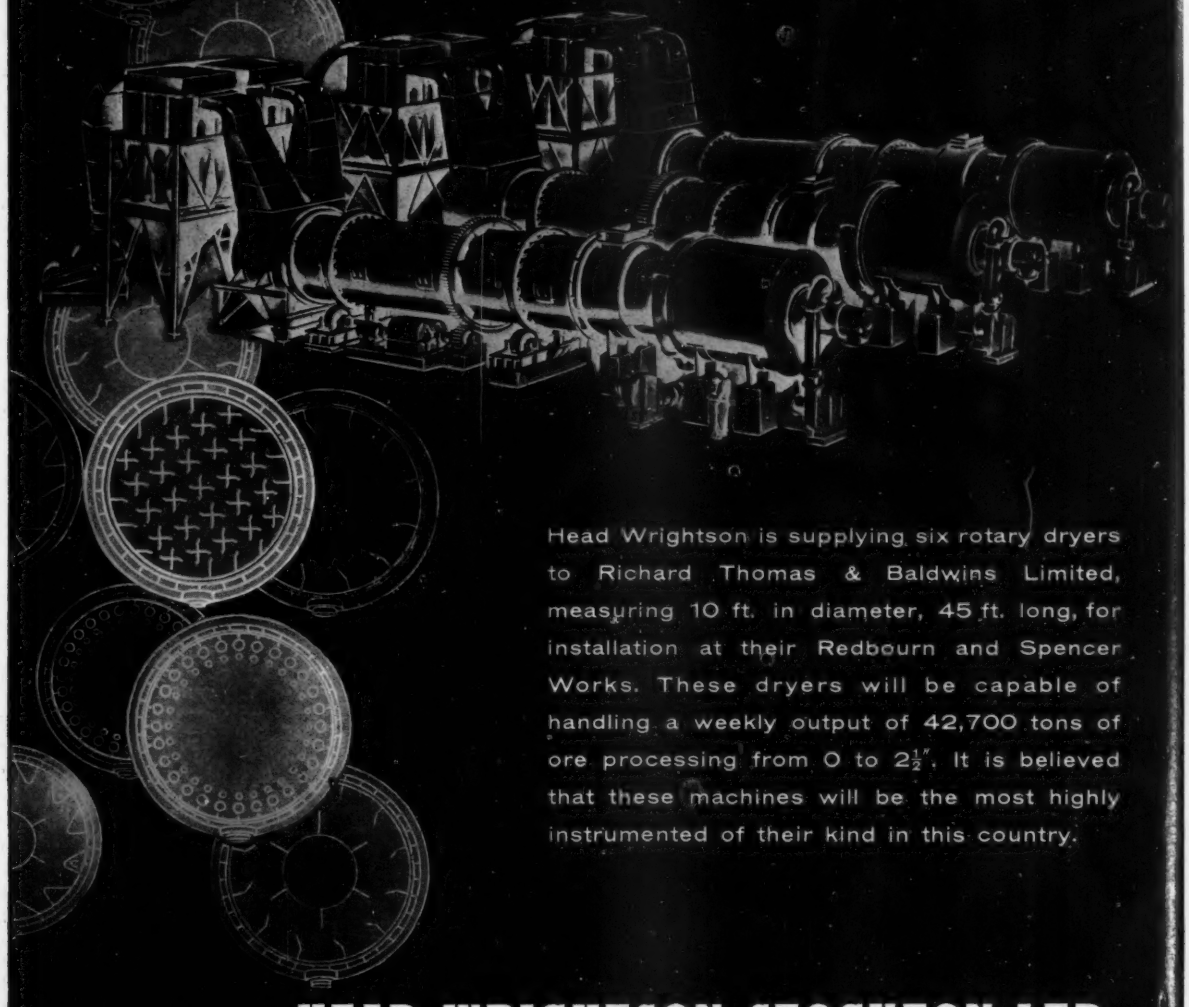
3. *Tracing.* Because of the great sensitivity of detection, radioisotopes are being used for tracing the movement of liquids and gases in underground formations. They are also used in industrial processes to trace the flow of materials, the degree of mixing, etc.

HEAD WRIGHTSON

RUGGLES—COLES

ROTARY DRYERS

FOR IRON ORE PLANT



Head Wrightson is supplying six rotary dryers to Richard Thomas & Baldwins Limited, measuring 10 ft. in diameter, 45 ft. long, for installation at their Redbourn and Spencer Works. These dryers will be capable of handling a weekly output of 42,700 tons of ore processing from 0 to 2½". It is believed that these machines will be the most highly instrumented of their kind in this country.

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Radioisotope-labelled chemical compounds are being used extensively, not only to study surface phenomena such as ore flotation and flocculation, but also to determine the sequence of steps in chemical reactions. Radioisotopes maintain their properties unchanged throughout the most complicated chemical or metallurgical processes, even at high temperatures. Therefore a tiny amount of a suitable radioisotope can be added to tons of fuel or ore, and still be traced easily in the products of high-temperature operations.

It is the radiations which radioisotopes emit that make them so valuable for industrial and scientific purposes. These radiations can be detected and measured with suitable instruments and recorded or used to actuate controls. Or the radiation readings can be derived as numbers which are fed into electronic computers for high-speed computation or automation purposes.

Need for Radioisotope Conferences

Radioisotopes offer some of the newest and most versatile techniques that are available to engineers and scientists. However, these uses have been developing so rapidly that it has been impossible for busy engineers to keep informed through regular channels. Many of the existing uses for radioisotopes in the mining and related industries had their first large-scale use abroad. The technical references in the coal survey previously mentioned were selected from some 2,500 published items originating in 15 countries and 5 continents. Some U.S. industries have lagged behind their foreign counterparts in putting radioisotopes to work. It is, therefore, important in the fast-growing field of radioisotope applications, to keep in close touch with world-wide developments.

Instrumentation and Automation

Among the new words which are appearing most frequently in technical literature today are the terms *optimization* and *automation*. Optimization is the systematic mathematical handling of variables to find the combination which gives the very best overall results. Automation uses automatic instruments, programmed computers and servo-mechanisms to produce these optimum results constantly, in spite of variations in operating conditions and requirements.

It is said that about 200 different parameters are now being measured in industrial processes. In most cases, several techniques and types of instruments are available to measure each of them. For various applications, radioisotope techniques appear to be definitely the best method, and sometimes the only practical way to get desired information. In many other uses, radioisotopes can successfully compete with or be used in conjunction with electrical, optical, mechanical and other methods of instrumentation and control.

Mechanization and automation offer such advantages to mass-production industries, that the survival of individual mining companies may depend on their adopting new techniques.

Mineral Exploration

Mining is an extractive industry which is continually depleting the best, cheapest and most accessible known deposits of ores and minerals. In the last 50 years the world has spent far more of its mineral wealth, than in all preceding history. The United States in particular, has been consuming its mineral reserves at an extraordinary rate.

Realistic mining companies try to discover and map out at least one ton of new commercial reserves for each ton of mineral that they extract. However, it is becoming more difficult and expensive to discover and evaluate by conventional methods, new reserves of various ores and minerals. We can no longer depend on outcrops or surface indications, but must probe deep into the earth for hidden reserves.

Radioisotope logging of boreholes has important possibilities for discovering economic minerals, and for determining the depth, thickness, and approximate quality of such concealed deposits. This includes low-cost prospecting for minerals in deep holes drilled for other purposes.

For example, about 50,000 oil and gas wells are drilled each year in the United States, to depths ranging from several feet to several miles. Practically all of these wells are already being systematically logged from oil or gas stand-points, with probes which measure and record various characteristics of the strata penetrated. The numerous logging methods used include radioisotope techniques. These have advantages for some oil well conditions and also have been used successfully to locate and measure other mineral deposits such as potash and coal.

In Colorado alone, 808 oil and gas wells were completed in 1959, at a drilling cost of more than $50,000,000. It would seem sensible to get maximum information from annual investments of this magnitude.

The recent development of high-energy neutron sources for down-hole use, opens up important new possibilities for the identification and measurement of various elements in boreholes, through neutron-activation techniques.

Where petroleum companies are not interested in searching for other minerals, mining companies or state or federal agencies could arrange for co-operative radioisotope logging of boreholes, in the search for other mineral deposits or ores of present or future economic importance. Deep wells for water, brine, etc., could also be logged.

An alternative method is the use above ground, of fast, automatic radiation methods to examine rock fragments or drill cores, to determine their mineral composition. One company has developed a general method to determine about 60 elements in an unknown sample based on the gamma-ray spectrum of irradiated sampler and changer with time.

Mine Layouts

Radioisotope logging can also be used to precede or supplement core drilling, when planning mine layouts. This is to locate faults, wants, slope of mineral veins or beds, the nature of associated strata, etc. Nuclear instruments can also be used to detect and estimate certain elements in accessible mine faces or outcrops. Another use is to locate boreholes for electrical cables, airshafts, etc., which fail to intersect mine entries.

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Large Scale Strip Mining Operations in the United States

LAST year opencast mining operations in the U.S. accounted for almost 30 per cent of the 413,000,000 s.tons of coal produced, representing a three-fold increase in the strip mine share of total production since 1940. At that time it was considered economical to strip mine only if the ratio of overburden to coal was less than 10 or 12 to one. This concept has been radically altered in the light of tremendous advances in the design and development of bigger and better opencast mining equipment.

Currently 30 cu. yd. machines are commonplace and much bigger ones are in use in some areas. Operators now talk in terms of 25 ft. of overburden per ft. of coal seam as being feasible and the end is not in sight.

Artist's impression of the new Peabody shovel. In one month of operation it will remove enough overburden to fill every car in a train stretching from Pittsburgh to Chicago

Largest Self-Propelled Vehicle

In the early autumn Peabody Coal Co. anticipate bringing into action a 7,000 ton power shovel, the largest self-propelled vehicle ever to be constructed, with a shovel capacity of some 170 tons and costing approx. $7,000,000. This giant machine is to strip off the overburden of a 65,000,000 tons coal deposit near Paradise, Kentucky. According to the operators, the machine will be so effective that it will be possible to deliver the strip coal to the Tennessee Valley Authority at a base price of $2.95 per ton, compared with the average industrial price of $4.73 at the pit head.

It would appear from past experience in the U.S. that the cost per ton of coal to the consumer is in inverse proportion to the size of the machine. Bigger machines need bigger capital outlay and in consequence it seems inevitable that the more affluent companies are going to capture an ever increasing share of the total market for coal in the U.S.

Apart from ample funds, opencast coal operators need large reserves and assured long-term markets. Peabody, for instance, has reserved the entire 65,000,000 tons of coal to be stripped by the big new shovel for sale to the T.V.A. under a 17-year contract.

Bright Prospect for Strip Mining

With the very high labour cost obtaining in the U.S., the high productivity achieved in opencast operations with the aid of big machines is making strip mining a far brighter prospect than underground mining. Significantly, ten new strip mines with an output of plus 1,000 t.p.d. were opened or placed in development last year, with a total daily capacity of nearly 50,000 tons. In contrast, only seven deep mines of plus 1,000 t.p.d. were started, and these had a total daily capacity of only 20,000 tons.

Between 1949 and 1959 average output per manshift on strip mining operations rose from 15.33 t.p.d. to 22.65 t.p.d. In the same period, underground miners boosted their o.m.s. from 5.42 to 10.08. Such increases in productivity were, of course, bound to be reflected in commensurate decreases in employment given a fairly uniform annual production, and in the decade ending 1959 the number of miners employed plummeted from nearly 434,000 to less than 180,000. There was a further drop of 20,000 miners employed during 1960, and the trend has seemed set for some considerable time to come. That this vast reduction in the labour force has been achieved painlessly is due to the co-operation between the United Mineworkers and the Coal Operators.

Stimulus Towards Productivity

The operators have been prepared to pay well for good results and the American coalminer now stands at the head of his national wage scale for manual workers. Not only are the miners well paid but their pensions, sickness and security benefits are well safeguarded under agreements between the Mineworkers' Association and the operators, by which 40 c. per ton are used to provide these benefits.

Probably no mining engineers have ever had greater stimulus towards greater productivity than those in the U.S. With labour costing an average of $24.25 per manshift and competition from oil and natural gas stiffening yearly, American coal operators have been strongly fighting for economic survival since the mid-1950's. The fight is still far from over but coal is holding its own, particularly in strip mining, and one might justifiably forecast that the current 22.65 tons per manshift does not represent the acme of achievement. Peabody's giant power shovel might well only prove the first of a new race of mammoths.

MINING MISCELLANY

The Swiss firm, Lonza Elektrizitäts-werke und Chemische Fabriken A.G. has announced plans to start production of silicon, germanium and indium.

★

What is claimed to be the biggest deposit of thorium in Europe has been found in the Silberberg mountain near Bodenmais, in Lower Bavaria, Western Germany. The Bayerisches Berg-und Hüttenwerk, which discovered the deposit, states that some 2,500 grammes of thorium and 150 grammes of uranium are present per tonne of granite gneiss and mica-slate. Although extraction of uranium from the Silberberg mountain site, at a height of nearly 3,000 ft. is uneconomic, it is planned to carry out large-scale thorium exploitation there.

★

The Belgian company, Syndicat Belge d'Entreprises à l'Etranger (Sybetra) is to build a zinc refinery at Saltillo, Mexico. Using the Overpelt-Lommel process, the new unit will produce about 30,000 tonnes of zinc per annum. The total plant will cost some B Frs. 900,000,000 to build.

★

Large deposits of lead and zinc ore are reported from Sasi, in the Zletovo mining basin in the Yugoslav area of Macedonia. The deposits are stated to be of high-grade ore, and capable of economic exploitation for at least twenty years. A new mine will be opened there in 1963, as part of the planned Zletovo lead-zinc complex, which it is claimed, on completion, will be one of Europe's main producers. An ore flotation plant for the production of lead and zinc concentrates will also be erected in the area.

★

Plans to modernize mines in the Nis area of Yugoslavia during the current five-year plan include work on the lignite mines in Aleksinac and Citluk, extending the Nova Jerma hard-coal mine, exploration projects in the Svrljig, Dimitrovgrad, Babusrica and Pirot coalfields, and building non-ferrous metal processing plants at Prokuplje and Nis.

★

Eldorado Uranium Mines, of Canada, which suspended production at its uranium mine last year when it sold its contract for cash to Eldorado Mining and Refining, has invested $5,000,000 of the proceeds in a land-development programme, to cost $12,000,000 in all, in the Bahamas. Grand Bahama Development Co. will be the operating company.

★

Reports from Bucharest state that work has been started on building what is said to be the largest integrated iron and steel works, at Galatz, Roumania. The works will cost about 4,000,000,000 lei, which is one-third of the total state investment in the iron and steel industry under the current six-year plan. When completed, in 1970, they will have an annual output of 4,000,000 tons of steel, which is more than double the total output of steel in Roumania in 1960.

Aberfoyle Tin N.L. has negotiated an option to purchase the mining titles of an open-cut mine at the Ardlethan tin field in New South Wales. Diamond drilling has commenced, and a sample batch of ore has been sent to the Australian Mineral Development Laboratories in Adelaide for testing. The company hopes to develop a large scale, low-grade, low-cost, open-cut mining project. Improved tin recovery techniques and high world tin prices in recent years have improved the value of the prospect.

★

Island Creek Coal Co., and Republic Steel Corporation are to begin development of a new mine in the Pocahontas No. 3 seam in Buchanan County, Virginia, U.S., through their jointly-owned subsidiary, Beatrice Pocahontas Co. The capital investment required for the new coal mine, which will have an annual capacity of 1,200,000 tons, will be approximately $15,000,000, of which Island Creek and Republic Steel will put up $5,000,000 in equal shares, the remainder to come from funds borrowed by the subsidiary. Coal from the Beatrice Mine will be used by Republic at its steel plants.

★

The Guatemalan government has approved a measure appropriating special funds for the Bureau of Mines and Hydrocarbons to enable them to carry out a thorough survey of the iron ore deposits in the the Province of Chiquimulilla. The Bureau is authorized to sub-contract the study if necessary.

★

The Coal Exporters' Association of the U.S. has forecast that coal exports from the U.S. in 1961 may reach about 27,000,000 tons, an increase of 2,000,000 tons over 1960.

★

An area of six acres, from which the Vaal River has been partially diverted for the building of a breakwater, is reported to be yielding diamonds at an average rate of £1,000 a week a head; of the Republic of South Africa's 380 licensed diamond diggers, 33 are at present working on the area, near Kimberley, and others are rushing to stake their claims.

★

The State government of Johore, in the Federation of Malaya, has introduced a new policy regarding mining leases, which aims to expedite mineral production, and prevent the creation of mining monopolies within the state. In future grants of mining leases will be limited to 750 acres to any one applicant, while a second mining permit will not be issued to an applicant until he has proved himself to be a genuine miner with a successful first attempt. It is expected that this system would open up operating mines by more companies, with resultant benefits to the state.

★

The Turkish government announces for the second half of the current year certain liberalization concessions for imports into Turkey of raw aluminium, ferrous alloys and ferrous products.

Coal production is to be raised to an annual rate of 150,000 tonnes during the next two years of South Viet-Nam's five-year economic development plan; thereafter it is to be raised to 250,000 tonnes a year.

★

Prospecting in Ontario during the first half of 1961 has increased, 9,072 claims having been recorded, compared with 8,522 during the same period last year. Increased staking was shown in half of the 14 mining divisions of Ontario. Sudbury was the most active with 1,240 recordings; Sault Ste. Marie, with 1,076 claims trebled the 1960 figure, and Patricia division had 1,010 claims. Other divisions in which an increase was shown are Kenora, Kowkash, Porcupine and Red Lake.

★

The Society of Mining Engineers of AIME, has organized the establishment of the Geological Engineering Unit Committee of the Mining and Exploration Division. The new committee, of which Prof. Shirley A. Lynch is chairman, hopes eventually to become a division of the Society in its own right. The new committee has organized a session of technical papers to be presented at the 91st annual meeting of AIME to be held in New York, February 18-22, 1962.

★

A commission is to be set up to recommend legislation on the Portuguese coal industry, bearing in mind the effect of Portugal's membership of E.F.T.A., on the importation of foreign coal. The Commission, which will present its report 90 days after the naming of its members, will review the types of coal needed in Portugal, conditions now prevailing in the Portuguese mining industry, the industry's wage structure and the problem of what should be considered to be an adequate return on capital employed.

★

Commercial production of tungsten is to begin at the mill of Chief Joe Tungsten Inc., 25 miles from Okanogan, Wash., U.S. The mill will handle 50 tons of ore a day, to produce about 250 lbs. of tungsten concentrates.

★

In our last week's issue, p. 131, with reference to Chile's proposals for mining expansion, it was stated that according to the Chilean Finance Minister, Kennecott planned to invest $200,000, Anaconda $100,000, and Cerro de Pasco $100,000. The correct figures should, of course, be $200,000,000, $100,000,000 and $100,000,000.

★

As from August 31 South West Africa's sole manganese producer, the Otjisondu Mine, is to be placed on a care and maintenance basis. Worked by the S. A. Minerals Corporation, the mine is under the technical management of Johannesburg Consolidated Investment Co. No reason has been given for the shut-down, the news of which came as a surprise to mining officials in the Territory. Last year the mine had an output of 64,327 s.tons, compared with 44,536 tons in 1959. This year the rate of production has further increased, averaging 7,253 tons monthly in the first six months, as compared with last year's monthly average of 5,620 tons.

Machinery and Equipment

Power Consumption of Grinding Mills

A recent study of the crushing and grinding circuits in nine plants indicates that there is a remarkably good correlation between the actual power used and that calculated either from Bond's ball mill grindability or Hardgrove's grindability and using Bond's formula, derived from his "third theory" of comminution. As far as Bond's grindability is concerned the relationship seems to be a straight line with a slope of one for smaller and medium sized ball mills, although for large mills the actual power requirements appear to be less than that calculated from Bond's grindability test. Furthermore, the roller and race mills tend to use less power than the calculated values. Similar results can be obtained for the Hardgrove grindability.

There is also a good straight line relationship between the actual power and that calculated from mill features using a slightly modified version of Bond's formula.

$$\text{h.p.} = 1.341\ (\text{Wb} + 0.1\text{Wb})$$

$$[D^{0.4}Cs\ (0.0616 - 0.000575Vp - (0.1)2\ \frac{Cs - 60}{10} - 1]$$

Where :

Wb = weight of ball charge in tons.
h.p. = horse power.
Cs = per cent of critical speed.
Vp = per cent of total mill volume occupied by ball charge.
D = mill dia. in ft.

The term (0.1 Wb) is added to take care of the weight of raw material among the balls of the ball charge.

Although Bond has calculated friction corrections for various types of mill they do not seem to apply to grinding cement clinker. It would also appear that a small correction is necessary (smaller than the proposed friction correction) for all mills.

These matters have been discussed by R. W. Smith in *Mining Engineering.*

MOLTEN-METAL AND FUSED-SALT RESEARCH

A fluorescent X-ray spectrograph that can study the surface chemistry of molten metal while it is oxidizing at temperatures of 1,650 deg. F. has been developed by the U.S. Bureau of Mines.

The development was hailed by the Department of the Interior as a major step toward devising equipment capable of close-up studies of materials at temperatures as high as 2,550 deg. F. Such a device of similar design would open new areas of research in fused salts and molten metals for Space Age technology.

The new instrument uses a resistance-wound electric furnace as a sample holder, bringing the molten surface being studied within half an inch of the X-ray tube window. It was devised by scientists of the Bureau of Mines Metallurgy Research Centre, who will use it as the basic tool in long planned dynamic oxidation rate studies of base metals. Details of construction and operation already tested by the Bureau are described in a technical report released by the Department. The report covers applications in preliminary studies of arsenic and antimony as impurities in lead and alludes to other possible uses.

A copy of Report of Investigations 5739, *Fluorescent X-ray Spectograph for Dynamic Selective Oxidation Rate Studies: Design and Principles,* can be obtained from the Publications Distribution Section, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. U.S.A.

RANGE OF SAMPLING EQUIPMENT

To meet present day requirements for speedy and accurate sampling of coal, coke and granular materials, any equipment must produce truly representative samples. But more than that, it must be sturdily constructed and capable of reliable operation however abrasive or dirty the material being handled.

The rotary dividers manufactured by Robert Dempster & Sons Ltd. embrace a wide range, the largest size usually being incorporated in the main material stream. The smaller sizes, whilst capable of doing the same job, are most popular for laboratory analysis.

The largest size divider is designed to reduce up to a maximum of 240 lbs. of small material to twelve equal samples of 20 lbs./each. The divider can be incorporated into any handling plant and arranged so that the rejects are returned via a chute back into the material stream to obviate manhanding. Starting and stopping is by push-button control and the divider can be rotated freely by hand when rejects are being discharged. Any number of compartments can be selected as samples though normally only one of the twelve is used, the others being rejected.

The twelve sampling compartments are of welded, mild steel construction, arranged equidistantly around a central core, this being sealed against ingress of material being handled. Each compartment has a hand operated simplex-type door to give quick discharge.

Apart from being smaller, the 100 lb. capacity divider for 8 lb. samples is generally similar in detail to the company's biggest machine. It has the same number of compartments and the simplex-type doors. The supporting frame carrying the divider and hopper is of welded tubular construction. Push-button controls are fitted, the starter being easy to reach. Wiring to the starter is enclosed in galvanized conduit.

This self-contained unit includes a vibrating feeder between the 100 lb. storage hopper and the divider to ensure a regulated feed. Rate of flow of the material can be varied by operation of the feeder control. Between the feeder and its controller the wiring is in flexible rubber sheathed cable. The drive is by geared motor.

Particularly suited to laboratory sampling, the 28 lb. capacity divider for 2 lb. samples retains the twelve compartments common to its larger versions. The same type of discharge doors are provided for speedy operation. The receiving hopper is fitted with a ball valve to control the feed rate. Starter controls are push-button type and wiring is in galvanized conduit. The driving unit is a geared motor. Ample space is provided beneath the divider for collection of samples and rejects in bins.

LARGE DIAMETER BORING MACHINE

The Ka-Mo G-160, a petrol-powered horizontal boring unit capable of boring 36 in. dia. holes, has been announced by the Kwik-Mix Co. a division of Koehring Co., United States.

The new machine consists of a 52 h.p. air cooled petrol engine, hook rollers and engine base, three-speed transmission and gear reduction with clutch, 9 g.p.m. hydraulic pump powering the feed mechanism, levelling outriggers, track, and connecting plates. Ratings for the G-160 range from 150 ft. of 36 in. dia. hole to 200 ft. of 12 in. dia., both maximum calculations for drilling with casing.

Claimed by the manufacturers as being especially suited for water, electrical, and pipeline work, the G-160 is a self-contained, compact unit featuring stability without auxiliary equipment. The power driven feed is said to eliminate the danger of deadman anchor, there is accurate control for maintaining grade and line and a variable speed to meet different formation conditions. In all, presented as a dependable and heavy duty construction tool to accommodate tough earth and rock boring.

NEW SHEARER PICK

The Mining Division of Wickman Ltd. announce that they can now offer for universal application on drum shearers their slug-insert beak type shearer pick. The pick, developed by extensive trials in the East Midlands Division of the N.C.B. has led to substantial reductions in power requirements together with an increase in the large coal content.

The initial tests with this form of insert took place in a Colliery in No. 1 Area of the East Midlands Division. The face had a cutting length of 138 yards, and was adversely affected by a fault of 2 ft. displacement. The floor was hard and

The Ka-Mo G-160 horizontal boring unit by the Kwik-Mix Co., a division of Koehring Co.

The **Wickman slug-insert beak type shearer pick**

undulating. Under such conditions it was inevitable that a high usage of the conventional type of shearer pick would result.

Since the introduction of the slug-insert beak shearer, there has been a considerable reduction in the total number of picks used. The time lost in replacing pick discards has been reduced to a minimum and ammeter readings taken during the cutting period showed that the machine was consistently operating at between 80 and a maximum of 90 amps as opposed to the previous rating of 80-120 amps.

The tests, carried out by N.C.B. personnel, showed that 257 conventional type picks were discarded in cutting 8,418 yards at a cost of 5.8d. per ton of coal produced. In cutting 5,107 yds., 28 slug-insert beak shearer picks were discarded at a cost of 2.4d. per ton of coal produced, despite a higher initial cost of pick.

AWARD FOR SAFETY BLOCK

Giving complete personal security to people in high places, and other dangerous locations, is the " Sala " safety block, which has recently been the subject of a special award for outstanding merit. The award was made by the American mining journal, *World Mining*, which makes annual awards for " the most outstanding contributions to the advance of minerals industries technology ".

The safety block functions as follows: it contains a 16 ft. length of steel wire rope which is spring loaded. This is controlled by a checking device which activates automatically if there is a sudden pull on the line. If the pull causes heavy loading as in the case of a fall, a braking device is brought into operation to absorb any snatch. To provide the user with working movement, the steel wire can be drawn out by a steady pull, and this in fact occurs automatically as he moves about, the wire remaining always taut.

In the event of a fall, the brake operates and gently brings the user to a halt within 12 in. and supports him. The block is used in conjunction with the special safety harness, a development of a normal parachute harness: the block having a locked hook for attachment to the harness.

Equipment Digest

The 5½ in. diameter polariscope manufactured by Sharples Engineering Co. (Bamber Bridge) Ltd. is unique in that provision is made for using it either as a diffused light or as a transmission instrument. The equipment is now being introduced to the market and is designed for photo-elastic analysis. The Sharples polariscope has been designed for serious research work, university and technical college lecture purposes and as a practical engineers' tool for the assessment of designs. It is a compact instrument mounted on its own cabinet, which contains ample storage space for models and special loading equipment, etc. It can be used in an engineering drawing office equally as well as in a university or industrial research laboratory.

★

Chamberlain Industries, Ltd., manufacturers of the Staffa range of hydraulic equipment and pipe bending machines, announce the introduction of a new range of hydraulic rams. Designated the BB type by the manufacturers, the rams are designed to operate on oil at a working pressure of 2,000 p.s.i. and there are seven standard bore sizes available, the largest having a thrust of forty tons.

Both single or double acting versions are manufactured with strokes ranging from ½ in. to 10 ft. The manufacturers state that the BB range of hydraulic rams is suitable for use in furnace loaders, hydraulic presses of all kinds, barrel washing plants, steel and alloy rolling mills, conveyor systems and all types of mechanical handling, mining and contractors' plant.

★

The variable phase adaptor type 446 manufactured by Dawe Instruments Ltd. is intended for use in conjunction with quadrature output oscillators such as the Dawe Type 442 and Type 445. With 0 deg. and 90 deg. inputs applied to the Type 446, multiple fixed phase outputs and a continuously adjustable single phase output are available to study the performance of single and multi-phase circuits. The wide frequency range from d.c. to 10 kc/s makes possible phase analysis of servo systems amplifiers and multiphase passive circuits at ultra low, power and audio frequencies. The accurately calibrated 0—360 deg. linear scale of the adjustable phase output enables a signal of known phase to be fed into a test circuit.

★

Two new electronic time delay relays, with ranges from 50 milliseconds to 20 minutes have just been announced by The A. W. Haydon Co., United States. Both instruments are capable of resisting 50g shock for 11 ms., the manufacturer states, as well as 20g vibration at 2,000 cps., and both have a standard accuracy of ± 10 per cent. Contact arrangements can be obtained from single-pole single-throw to four-pole double-throw, and units are available for either direct or alternating current operation. The nine ounce Series 32,400 Time Delay Relay has a range from 120 seconds to 20 minutes, and can have a reset time of only 15 milliseconds. The Series 32,200 Time Delay Relay weighs only 7 oz., and has a range from 50 milliseconds to 120 seconds.

When operating an air compressor, it is an advantage to be able to check the output at intervals so that a reduction in performance or a mechanical failure can be detected in the early stages. In addition, it is also useful to check the output after overhaul to make sure that the performance and control adjustment is correct. The Muntz compressor output tester, designed in accordance with BSS.726/39, can be used to measure the output and also check the pressure gauge on the compressor.

The compressor tester consists of an accurately machined nozzle fitted at one end of a steel body; the other end being screwed to fit on to the off-take cock. A pressure gauge and a thermometer are fitted to the body of the tester. Two nozzles are provided, the 5/16 in. dia. size covering the range 54 cfm. to 148 cfm. and the 7/16 in. dia. from 90 cfm. to 290 cfm. A blank plug is also supplied so that when fitted in place of the nozzle and the off-take cock is opened, the pressure gauge on the machine can be checked against the one on the tester.

★

The Corrosometer, marketed in Great Britain and the Commonwealth by Winston Electronics, Ltd., on behalf of the Crest Instrument Co., Santa Fé Springs, U.S.A., creates a new standard in the measurement of corrosion in the laboratory, process and storage plants in very many industries by giving a swift direct reading of the corrosion rate in less than a minute. By using this instrument and its probes the efficiency of anti-corrosion methods may be ascertained and also remedial action may be carried out at the appropriate time, thus eliminating accidents, damage to plant and hold-ups.

By means of its system of probes, the one instrument, which can be operated from the mains or battery, can measure corrosion at a considerable number of points. The probes consist of an exposed specimen of the material from which the pipe line, reaction chamber, or storage tank or laboratory sample is made, a reference specimen and a check specimen.

The reading from the probe is directly in micro-inches or centimetres on the meter removal of the specimen, and the Corrosometer may be used for all metals and alloys. Each reading takes less than one minute and is independent of system temperature and of the environment. The probe is connected to the Corrosometer only at the time when the reading is made.

The Corrosometer determines the progress of the corrosion on the metal specimen by measuring the increase in electrical resistance as the cross section of specimen is reduced by corrosion.

★

The Model 130C insulation tester by Electrical Instruments Ltd. covers a very wide range of resistance readings and enables tests to be made on all types of components including resistors, condensors, switches, transformers, motors, elements, domestic appliances, general wiring, circuits, continuity, etc. Total resistance measurements covered are from 20 ohms to 1,000 megohms and for insulation measurements a test voltage of 500 V. d.c. at infinity is applied to the component under test via a safety push button switch. Measurements are made on a clear, easy to read 5 in. scale.

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Metals and Minerals

Thompson's First Nickel Shipment Reaches U.K.

A notable event in the U.K. metal trade was the arrival of the first consignment of nickel from Thompson, Manitoba. Shipped at the Hudson Bay port of Churchill at the beginning of the very brief open season, it arrived at Swansea on August 12, en route for the Clydach works of the International Nickel Co. (Mond) Ltd. There the 2,700 tons of full-sized cathodes will be cut to 4 in. squares and packed for distribution to European steel mills and other consumers.

The $185,000,000 Thompson project is expected to increase the world's annual nickel supply by some 37,500 tons, half of which is destined for consumption on this side of the Atlantic. Formally opened at the end of March, the new plant is expected to provide Europe with 6,000 tons before ice closes the direct shipping route from Churchill this year.

The arrival of Thompson's first shipment coincides with Inco's interim report for the six months ended June 30, 1961, which states that deliveries of nickel in all forms during the six months were slightly below the the total deliveries in the corresponding period of 1960 and about 10 per cent above the deliveries for the second six months of 1960. With the U.S. steel industry looking forward to increased activity this autumn, states the report, the outlook is that nickel demand will strengthen further in the last six months of the current year.

The short-term outlook for nickel in the U.S. is discussed more fully in a recent report by B.D.S.A., which predicts that U.S. consumption of nickel in 1961 will be little changed from last year. The anticipated rise in steel output during the third and fourth quarters as compared with the corresponding quarters of 1960 should be accompanied by increased nickel consumption, which should be sufficient to bring the total for 1961 up to about last year's level. Because of the prospective rise in consumption and the present low inventory, consumers are expected to increase their reserve stocks during the months ahead.

The supply of nickel made available for U.S. consumption through normal commercial channels is more than adequate to provide for peacetime demand, states the B.D.S.A. report. In addition to the nickel normally imported for U.S. consumption, there are currently more than 10,000 s.tons of Nicaro sintered nickel oxide in stocks available for distribution to U.S. industry. Moreover, ferronickel is being produced in the U.S. at an annual rate of about 11,000 s.tons (contained nickel) and offered commercially for sale.

★

The important part played by nickel in the development of modern coinage systems is discussed by Mr. Henry S. Wingate, chairman of INCO, in a message accompanying the interim financial report. Mr. Wingate maintains that nickel is in many ways the ideal metal for coinage. It holds the unique distinction of being the only widely used addition in modern times to the list of classical coinage metals. The statement points out that, in addition to its resistance to corrosion and wear, nickel is readily fabricated and also has excellent mechanical properties. Besides such properties as colour and ease of striking, pure nickel has the added advantage of being magnetic and therefore difficult to counterfeit. Furthermore, its intrinsic value is in line with the minor denomination coins for which it is employed.

Each year, states Mr. Wingate, the nations of the world mint almost 2,500,000,000 coins which contain nickel in amounts varying from 1 per cent to 100 per cent. The 75 per cent copper-25 per cent nickel alloy that has become the mainstay of most of the minor coinage systems has accounted for about half the nickel consumed for coinage during the past century. By the end of 1960, more than 40,000 s.tons of nickel had been struck into coins of pure nickel. In recent years more than 2,500 s.tons of nickel have been used annually for coinage, equivalent to about 1 per cent of the world's present nickel consumption for all purposes.

QUEBEC LITHIUM EXPANDS...

Quebec Lithium Corporation, the only producer of lithium concentrates and lithium chemicals in Canada, is to enlarge its refinery facilities according to *The Northern Miner*.

The present plant, which is about 30 miles north of Val d'Or, Quebec, produces an ultra pure lithium carbonate, the expanded plant will produce a second lithium salt—lithium hydroxide monohydrate—which should make an appreciable difference to the company's entry into major world markets for lithium salts.

...SO DOES MOLYBDENITE CORPORATION

Another Canadian sole producer, the Molybdenite Corporation, is taking advantage of the improved demand for molybdenum by increasing its production capacity. Milling rate is to be raised from 650 tons per day to an eventual 900 tons per day. In this connection it is worth noting that the corporation not only has an interest in a potentially new producer, Preissac Molybdenite Mines (also in Northwestern Quebec) but also controls the management of the company. Preissac is apparently making encouraging progress in its underground work and shortly may be in a position to decide whether to build a mill of about 1,200 tons per day capacity.

★

According to American Metal Climax overall demand for molybdenum continued strong during the second quarter of the year. Foreign demand remained at the high level experienced since early in 1960.

U.S. ALUMINIUM EXPORTS RISE

A report issued by the Business and Defence Services Administration in Washington states that U.S. exports of crude aluminium in June reversed the decline which began in January this year. June exports amounted to 13,500 s.tons, compared with 7,000 s.tons in May, shipments of 4,000 tons to Yugoslavia being responsible for the bulk of this increase. The six-month total was 69,500 s.tons, compared with 162,000 s.tons in the corresponding period of last year.

(Continued overleaf)

LONDON METAL AND ORE PRICES, AUGUST 17, 1961

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £230 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 0d. lb.
Cerium (99%) net, £15 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 250s. 11½d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram
Magnesium, 2s. 2½d./2s. 3d. lb.
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £660 per ton
Osmium, £17/£22 oz. nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £27 7s. 6d./£27 17s. 6d.
Quicksilver, £63 ex-warehouse
Rhodium, £43/£45 oz.
Ruthenium, £14/£16 oz. nom.
Selenium, 46s. 6d. per lb.
Silver, 79½d. f. oz. spot and 80½d. f'd.
Tellurium, 37s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis		30s. 0d./33s. 0d. per unit c.i.f.
Beryl (min. 10 per cent BeO)		270s./275s. per l. ton unit BeO
Bismuth		65% 8s. 6d. lb. c.i.f.
		18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable 48%)	(Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
" Hard Lumpy 45%	(Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%		£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Kaluchistan 48%	(Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10:1) $Nb_2O_5 : Ta_2O_5$		150s./160s. 0d. per l. ton c.i.f.
Lithium Ore—		
Petalite min. 3½% Li_2O		50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		76s. 0d./80s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O		75s. 0d./85s. 0d. per ton f.o.b. Beira
Magnesite, ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46%-48%) basis 60s. 0d freight		73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)		69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)		nom.
Molybdenite (85%) basis		10s. 0d. per lb. (f.o.b.)
Titanium Ore—		
Rutile Australian 95/97% TiO_2 (prompt delivery)		£23 5s. per ton c.i.f.
Ilmenite Malayan 50/52% TiO_2		£11 10s. per ton c.i.f.
Ilmenite Travancore 58/60% TiO_2		£15/£15 10s. per ton c.i.f.
Wolfram and Scheelite (65%)		128s. 0d./132s. 0d. per unit c.i.f.
Vanadium—		
Fused oxide 95% V_2O_5		7s. 6d./8s. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65-66% ZrO_2		£16 ton c.i.f.

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OFFICES AND AFFILIATES THROUGHOUT THE WORLD

U.S. imports in June this year at 15,000 s.tons were about the same as in May. For the first six months of this year they totalled 81,500 s.tons, being an increase of 1,000 s.tons over the first six months of 1960.

★

Kaiser Aluminium and Chemical Corporation has announced its intention of raising aluminium production to about 90 per cent of capacity by re-opening a potline at its reduction plant at Chalmette, Louisiana. Each potline at Chalmette has an annual capacity of 27,500 tons of primary aluminium. This increase in output, which is attributed to improved business conditions, is the first by Kaiser Aluminium since May 31, previous to which the company was operating at 85 per cent of capacity. As recently as mid-April it was operating at 52 per cent of capacity.

★

The Reynolds International Co., a subsidiary of Reynolds Metal, has confirmed that it is forming a new company with the Mitsubishi group in Japan to be called Mitsubishi Reynolds Aluminium Co. The total capital will be $30,000,000 of which Reynolds is putting up one third. The production capacity of the new company is set at 39,000 s.tons of aluminium products annually. Production is scheduled to start in 1963.

★

Alcoa has reduced prices on various grades of alumina used as raw materials in the ceramic industries. The cuts average ½ c. per lb. on certain key grades selling between 7 and 8 c. per lb. The company states that the reductions have been made possible because of lower processing and manufacturing costs and increased alumina demand, which have more than offset recent wage increases.

★

The Madhya Pradesh government is reported to be actively considering ways and means for establishing aluminium plants to enable full and proper exploitation of the State's abundant high grade bauxite deposits. A team of Hungarian experts will shortly be arriving in India to advise the Government of India on the establishment of a public sector aluminium plant and will visit the hilly region of Amarkantak. This region is said to contain the richest deposits in Madhya Pradesh, but bauxite has also been located in the Balaghat, Bilaspur, Surguja, Raigarh and Seoni districts. In addition, low grade coal for power generation is stated to be available in abundance round Amarkantak, where a 60,000 kW. thermal station is already under construction.

The State Government is reported to have received offers from some leading industrialists for establishing aluminium plants in the private sector.

★

Describing a large flotation plant which is being erected in the town of Mirny, centre of Yakutia's diamond mining industry, *Pravda* reports that it is being built almost completely of aluminium.

MORE VANADIUM FROM FINLAND

The Finnish undertaking, Otanmäki Oy, supplier of 10 per cent of the current world demand for vanadium, is to raise vanadium production capacity by 40 per cent. Exports go mainly to Europe.

Copper · Tin · Lead · Zinc

(From Our London Metal Exchange Correspondent)

The holiday season still exerts its influence on markets.

CHILE STRIKES CONTINUE

Copper stocks in U.K. official warehouses have risen by 90 tons to 21,741 tons and on the L.M.E. there has been a slight narrowing in the contango. In Chile where the strikes continue, no move has been taken by either side towards re-opening direct talks between the El Salvador and Potrerillos Unions and the company. The Labour Minister is reported as saying that he would not intercede in the dispute unless requested to do so by both sides. In the U.S. Kennecott are resuming negotiations with the Steel Workers Union in a final endeavour to fix up a new contract to replace that which expired at the end of July. The labour is working on a day-to-day basis and the Unions have the power to call a strike at any moment. The riots in Rhodesia have not so far affected the Copperbelt.

The Chilean Copper Department announced that total production in the country for June totalled 45,946 tons as against 44,713 tons in May, whilst exports rose in June to 58,233 tons against 41,565 tons in May. The total half year production amounted to 280,255 tons and the total exports to 286,446 tons, thus indicating a reduction in stocks held in that country.

The scrap situation in America still remains tight and at the end of last week the custom smelters intake price for No. 2 scrap was raised by ¼ c. to 26¼c. per lb. The other prices in America are firmly based on the 31 c. per lb. level, with most producers being sold out for August, but there being no unusual urgency about purchases for September delivery.

TIN MOVES STEADILY UPWARDS

Tin stocks in U.K. official warehouses have fallen by 125 tons to 6,011 tons. Prices on the L.M.E. have risen steadily, whilst the contango has shown little change. Malayan production for the first half of the year totalled 27,130 tons of tin which compares with 25,018 tons in the corresponding period of 1960 and lends weight to the often expressed opinion that attempts to increase production in Malaya following a complete lifting of export controls are proving difficult.

Stocks of metal and tin in concentrates in June totalled 8,796 tons, which showed a substantial reduction from the end of May figure of 9,769 tons.

It has been announced in Washington that another 1,000 tons of Longhorn grade tin is to be offered for sale by G.S.A. on August 30.

On Thursday the eastern price was equivalent to £960¼ per ton c.i.f. Europe.

LOWER LEAD-ZINC STOCKS

Lead stocks in U.K. official warehouses have fallen by 955 tons to 10,249 tons and zinc stocks by 269 tons to 6,259 tons. Prices on the L.M.E. for both metals have remained steady. In the case of lead there has been a tendency for the contango to widen. There is nothing at present to suggest any price movement one way or the other.

In the U.S. the House of Representatives Interior Committee has told Congress that, based on last year's production, 273 mines (producing 58,032 tons of lead and zinc combined in 1960), could be helped by a subsidy on their production. The House Rules Committee has been asked to schedule a Bill for debate and may act on this this week.

U.K. CONSUMPTION

The statistics issued by the British Bureau of Metal Statistics for the month of June, with the May figures in parentheses (all in l.tons) were :

Copper consumption	63,694	(58,522)
End month stocks ...	145,267	(128,476)
Tin consumption ...	1,822	(1,807)
End month stocks ...	9,151	(11,330)
Lead consumption	32,966	(31,117)
End month stocks ...	62,286	(56,467)
Zinc consumption ...	30,671	(30,085)
End month stocks ...	67,796	(65,515)

Consumption of copper for the first six months of 1961 was 5 per cent down on the corresponding period in 1960 at 356,058 tons. Consumption of tin was down to 10,959 tons, a reduction of about 7 per cent. Consumption of lead at 189,064 tons showed a reduction of a little over 1½ per cent whilst zinc consumption at 176,726 tons was lower by about 7½ per cent.

OFFICIAL TURNOVERS

Official turnovers (in l.tons) for the week ending August 11, with the previous week's figures in parentheses are :—

Copper	10,075	(18,150)
Tin	930	(1,615)
Lead	7,675	(8,200)
Zinc	5,650	(6,550)

WORLD COPPER STATISTICS

U.S. Copper Institute figures for July (June totals in parentheses) in s.tons are :—

In U.S.A.

Refined Production	128,447	(141,140)
Domestic deliveries	113,431	(139,700)
End month stocks ...	82,856	(89,008)

Outside U.S.A.

Refined Production	176,139	(166,319)
Deliveries	172,167	(199,246)
End month stocks ...	340,823	(312,652)

Closing prices are as follows :

	August 10		August 17	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£229¾	£230	£230½	£230¾
Three months ..	£233½	£234	£233¾	£234
Settlement ..	£230		£230¾	
LEAD				
Current ½ month	£64⅜	£64½	£64	£64⅛
Three months ..	£66	£66⅛	£65⅛	£65⅜
TIN				
Cash	£924½	£925	£942	£943
Three months ..	£936	£936½	£954	£955
Settlement ..	£925		£943	
ZINC				
Current ½ month	£76½	£76⅝	£76⅝	£77
Three months ..	£77¼	£77⅜	£77⅛	£78

Mining Finance

International Taxation and the Mining Industry

The problems of international taxation probably affect the mining industry more directly than any other, since mining is the backbone of the economy of most emergent countries, which are invariably dependent upon the smooth international flow of capital funds from outside sources for the financing of major development projects. This is well illustrated by the amount of United States capital in South American mining or of British capital spread throughout mining interests in Africa.

The need to accelerate the rate of economic development in the less developed countries in the world is undeniable and that a large part of the basis for economic development can only come from the mining industry is equally true. However, in many such countries one of the principal limiting factors is the shortage of capital which cannot readily be made good out of savings from domestic sources. The root cause of this shortage is often lack of confidence among overseas investors in the political situation; but one of the other main factors influencing foreign investment decisions is taxation.

It is widely recognized that ideally an income should only be taxed once and that the right to tax rests with the country where the revenue can be said to have arisen. In the case of mining, this is, of course the country where the mine is situated. However, whilst the countries from which the capital originates usually recognize the justice of this principle by giving some credit to the investor, they rarely go far beyond an arbitrary allowance against their own tax claims.

This claim to tax in the country of residence is one of the major problems in the expansion of private enterprise internationally, for any fiscal policies that the developing country might adopt are rendered almost ineffective, as far as the foreign investor is concerned, by the pattern of taxation in his own country which determines the yield from activities elsewhere.

These are all problems which the council of the International Chamber of Commerce has recently been considering and its report entitled "Taxation Policies in Relation to International Investment" is a valuable document. In making recommendations to encourage the import of capital to the developing countries the council has urged that more attention should be paid to detail in the measurement of taxable income. A number of specific points are mentioned, including the recommendation that allowances should be made for capital expenditure in connection with mining projects where the value of the property is diminished by depletion.

As soon as a British investor decides to invest in overseas mining, whether through the medium of a British or an overseas registered company, he is immediately confronted with the difficulties of international double taxation. In certain respects, this can be an advantage, depending upon the investor's personal tax position, for the provisions for double tax relief can considerably enhance the apparent yield on a particular overseas share.

Taking as an example the large Copperbelt mine, Nchanga, it was mentioned in these columns last week that the current yield was 14.3 per cent. Making an adjustment for D.T.R. for an investor with an "effective rate" of 5s. 0d. the gross yield would be 19.33 per cent. The maximum yield on the Nchanga shares, applicable when the "effective rate" is 7s. 6d. or over, is 23.20 per cent. In the case of the East Geduld Mines the present yield, without double tax relief, is 21.5 per cent yet with maximum relief, available to an investor with an "effective rate" of 11s. 1d., the yield is 43.7 per cent. The yield for an investor with an "effective rate" of 5s. 0d. is 28.7 per cent.

With yields in this range it is not surprising that the South Africans are often tempted to ask why their shares are not attractive to at least a selected group of investors!

Tin Company Outputs and Dividends

	Financial year end	Tons of Tin Concentrates produced: This financial year to date	Last financial year to date	Last financial year TOTAL	Dividends declared‡: This financial year to date	Last financial year TOTAL
EASTERN						
Ampat	Dec.	314·8 (6)†	416·5†	879·2†	—	3/7·2d.
Austral Amal.	June	2060·5 (12)	1651·0	1651·0	—	—*
Ayer Hitam	June	2385·0 (12)†	1893·8†	1893·8†	—	1/3d.*
Berjuntai	April	623·5 (2)	300·0	2726·8	—	—*
Chenderiang	March	65·2 (3)†	58·2†	251·8†	—	—*
Gopeng Cons.	Sept.	1578·2 (9)†	997·0†	1467·2†	2/3d.	2/3d.
Hongkong Tin	Sept.	412·5 (9)†	224·2†	304·2†	—	9d.
Idris H.	Dec.	179·8 (6)†	123·8†	339·2†	4·5d.	1/6d.
Ipoh Tin	March	17·5 (3)†	131·5†	245·8†	—	—*
Kampong Lanjut	March	453·8 (3)	280·2	1948·2	—	—*
Kamunting	March	499·0 (3)	419·0	1591·8	—	7·5d.*
Kent (F.M.S.)	Dec.	193·2 (6)†	121·5†	267·5†	4·5d.	7·5d.
Kepong D.	June	407·5 (12)†	Nil †	Nil †	—	2/–*
Killinghall	Sept.	220·0 (9)†	310·5†	422·5†	—	1/3d.
Kinta Kellas	March	48·6 (4)	109·3	286·7	—	1/9d.
Kramat Tin	March	119·2 (3)	169·8	621·2	—	6/–
Kuala Kampur	March	392·0 (3)	369·8	1523·2	—	8/–
Larut Tin	Dec.	164·0 (6)	Nil	119·5	—	6d.
Lower Perak	April	246·0 (2)	218·5	1260·5	—	1/3d.*
Malayan Tin	June	2751·0 (12)†	3299·2†	3299·2†	—	1/6d.*
Malaysian	March	39·4 (4)†	42·3†	106·3†	—	—*
Meru Tin	June	28·5 (12)	36·0	36·0	—	—*
Pahang	July	2326·7 (11)†	2009·8†	2252·0†	—	6d.*
Pengkalen	Sept.	452·2 (9)†	294·2†	391·5†	1/1·5d.	1/–
Petaling	Sept.	1053·0 (9)	806·0	1129·8	—	9·8d.
Rahman H.	June	369·9 (12)	231·9	231·9	—	—*
Rambutan	June	233·5 (12)†	129·5†	129·5†	—	6d.*
Rantau	June	799·0 (12)	537·2	537·2	—	1/4·8d.*
Renong	June	559·5 (9)	640·5	883·8	—	—*
Selayang	Sept.	12·0 (9)	113·0	118·5	—	2·4d.
Siamese Tin and subsidiaries	Dec.	1226·0 (6)†	1196·0†	2681·0†	6d.	2/9d.
S. Kinta	March	1194·2 (3)	952·0	3896·8	—	2/1·2d.*
S. Malayan	June	3563·5 (12)†	2734·8†	2734·8†	—	2,6d.*
Sungei Besi	March	372·0 (3)†	372·5†	2012·8†	—	1/6d.*
Sungei Kinta	Dec.	Nil (3)†	27·5†	27·5†	—	—
Sungei Way	June	1360·0 (12)†	1180·5†	1180·5†	—	4·2d.*
Tanjong	Dec.	324·2 (6)†	481·5†	959·8†	1/–	4/1·5d.
Tongkah H.	June	309·8 (12)	937·0	937·0	—	3/–*
Tronoh	Dec.	1982·2 (6)†	1754·2†	3302·0†	2/–	3/6d.*
NIGERIAN						
Amal. Tin	March	1024·0 (3)	1045·0	4808·0	—	6d.*
Columbite		177·0 (3)	141·0	722·0		
Bisichi	Dec.	328·5 (6)	274·5	636·5	—	6·75d.
Columbite		232·5 (6)	187·0	458·0		
Ex Lands	Dec.	303·0 (7)	307·0	540·0	—	8·4d.
Gold and Base	Dec.	394·0 (6)	371·0	751·0	—	3d.
Columbite		23·0 (6)	45·0	79·0		
Jantar	Sept.	186·5 (10)	154·1	199·1	—	6d.
Columbite		310·0 (10)	184·1	238·0		
Jos Tin	July	118·5 (10)	114·0	141·0	—	—*
Kaduna P.	Dec.	39·0 (7)	38·2	77·5	—	9d.
Kaduna S.	Dec.	165·0 (7)	154·0	266·0	—	7d.
Naraguta K.	Dec.	27·6 (6)	48·5	117·0	—	—
U. Tin	March	37·0 (3)	51·0	238·0	—	—*
Columbite		1·5 (3)	2·0	21·0		
MISC.						
Beralt	March	12·0 (3)	22·0	53·0	—	1/–*
Wolfram		693·0 (3)	657·0	2079·0		
Geevor	March	228·0 (4)	217·0	657·0	—	2/6d.
Rooiberg	June	1134·0 (12)	1103·0	1103·0	—	5/–
S. Crofty	Dec.	541·0 (7)	499·0	856·0	—	—

* Final dividend not yet declared. † Tons exported. ‡ Up to date at time of going to press.

RECORD PRODUCTION AT INDIAN COPPER

Partly due to the fact that there was no annual shut-down during the year ended December 31, 1961 and partly due to an increase in daily output, the figures for both the tonnage milled and production of copper were records for the year. This increase in output, together with the small increase in price received for copper throughout the year as compared with 1959, has resulted in the net earnings showing an advance of some 13 per cent. (The annual shut-down for overhaul normally takes place at the beginning of each year but due to the smelter breakdown which occurred towards the end of 1959, the 1960 overhaul was brought forward into 1959.)

Despite the increase in net earnings the dividend rate has been maintained at 27 per cent, subject to the deduction of Indian income tax, the additional earnings having been appropriated for capital expenditure. During the year the net outlays of £342,666 exceeded the depreciation allowance by some £167,000 and with the plans for the further development of the mine this rate of capital expenditure is bound to continue. It has been estimated that the new crushing plant, smelter and small concentration plant alone will cost approximately £1,000,000. Work has now started on the foundations for the new refinery and it is anticipated that the project will be completed on schedule, at the end of 1962.

In his address to shareholders, extracts from which appear on page 176, the chairman, Mr. P. E. G. W. Parish, has spoken of the rumours that have been in the market from time to time concerning

the issue of bonus shares. He has made it quite clear that it is not the directors' intention to recommend the issue of bonus shares, nor is it their intention to make a rights issue at the present time. Mr. Parish said that the company has sufficient cash for its immediate plans, though if in due course further funds are required, then the question of a rights issue will again be considered.

UNITED STATES PREPARED TO JOIN I.T.C.

Speaking at the Latin American Economic Conference the Secretary of the United States Treasury, Mr. Douglas Dillon, has said that the U.S.A. is prepared to enter the International Tin Agreement. In London a spokesman for the I.T.A. has declined to comment on whether an official approach has yet been made by the United States to the Council.

In relation to the long term stability of the tin market this is a most important move, for the United States, whilst not a primary producer, is far and away the largest single consumer and the I.T.A. without her has always been in the nature of Hamlet without the Prince of Denmark. There is the further point that the United States stockpile is equal to more than two years' world production.

In the short term one obviously tries to read into this latest move some significance with respect to the current tin position, but in fact the American position is so clouded with political considerations that it is difficult to interpret its true significance. Presumably the United States has signified its readiness to join the Council as a gesture to the underdeveloped countries in general and Bolivia in particular as an assurance of consumer support. On the face of it, this would seem to be against America's best interests as a consumer but we have seen recently that the State Department is prepared to go to almost any lengths to please the Latin American countries.

The controlling factor in the tin price in the near future is clearly going to be the price at which the U.S.A. is prepared to release portions of the stockpile and this has been the subject of considerable argument within the U.S.A., between the consumers' and the State Department with its interests in South America. The announcement that the States are prepared to join the Council could be taken as indicating that the political interests have won at least the first round and that it is in fact a bull point for the producers.

POWELL DUFFRYN RESTRICT DIVIDEND

The Powell Duffryn consolidated net profit for the year has increased from £1,29 893 to £1,504,294. The directors have stated that it was their intention to increase the final dividend payment to 12 per cent, bringing the total for the year to 18 per cent as compared with 16 per cent for the previous year. However, following the Chancellor's request for a restriction on dividend increases, the board has recommended that the final dividend remain unchanged.

The directors have not given any indication of whether this retention will be placed to the credit of any particular account but it would not be unreasonable if the shareholders were to ask at the meeting for the money to be placed to a dividend reserve account.

ALUMINIUM LTD. AND NKK OF JAPAN

It has been announced that Aluminium Limited is to participate in the equity of Nippon Light Metal Co. (NKK) to the extent of a further $4,400,000. The Canadian company already holds fifty per cent of the capital of NKK, the largest aluminium producer in Japan, and the other shares are held publicly in Japan.

The change in the NKK equity stock includes an equal amount to be subscribed by the other shareholders and thus Aluminium Limited's participation will remain at fifty per cent. Recent market quotations in Japan put the total valuation of the company slightly above $100,000,000.

Tehidy Minerals' Increased Dividend.—At the time of the scrip issue at the beginning of the year a warning was given that the issue did not mean that the total dividend distribution would in fact be any greater; however, in the event the directors have recommended a final dividend of 7½ per cent bringing the total payment for the year to 10 per cent (on the basis of the enlarged capital) as compared with 8¾ per cent for the previous year. This increased payment has been made possible by the substantial increase shown in the revenue from investments; the receipts from the mineral properties have, in fact, fallen slightly.

Diamonds in Basutoland.—Speculators have been flooding into Basutoland in anticipation of a diamond rush in the Letsa-La Drai area in the Protectorate. The licenses for diggings are to be restricted to Basuto actually resident in the Protectorate, but Europeans are said to be flying into the area in order to finance the local Africans and thus gain a share in the workings.

Harties Shaft Intersection.—The No. 4 shaft at Hartebeestfontein has intersected the Vaal Reef at 6,656 feet below the collar. The reef was sampled at 5 ft. intervals and seventeen sections sampled gave an average value of 5.22 dwt. gold and 0.62 lbs. uranium over a channel width of 23.9 in., equivalent to 330 in.-dwt. and 22.05 in.-lb. respectively.

President Steyn.—Borehole K.P. 12 situated 5,900 ft. south-east of the President Steyn No. 2 shaft has intersected the basal reef at a depth of 6,540 ft. assaying 13.8 dwt. over a corrected width of 23.9 in., equivalent to 330 in.-dwt. A deflection is being made.

Geevor Preliminaries.—The profit for the year before taxation has been announced as £65,613 for the year ended March 31, 1961 as compared with £58,463 for the previous year. Taxation has also increased, from £27,542 to £32,181. The directors have recommended a final dividend of 2s. per share bringing the total payment for the year to 2s. 6d.

Kampong Lanjut Tin.—Shareholders have already been advised that due to considerations of Malayan income tax it has been decided not to make a further dividend payment during the fiscal year to December 31, 1961. However, the report and accounts for the company's financial year ended March 31, 1961 show that the undistributed profits for the year amount to £296,493 bringing the total unappropriated balance at March 31, 1961 to £430,112. The meeting is to be held, in Malaya, on September 6, and no doubt the chairman will take the opportunity of explaining to shareholders the company's future dividend policy.

London Market Highlights

It might have been expected that with the further disturbances in the Northern Province of Northern Rhodesia, the Copperbelt shares would have taken a further tumble but it seems that the present discount is sufficient to cover the localized unrest. Another factor was, of course, the strike in the South American mines; in the normal course of events this would have been taken as a bull point for the Rhodesians, on the basis of an increased metal price. At the beginning of the week dealers found that instead of there being any selling the lower quotations were, in fact, attracting a few buyers. Since then, the Rhodesian section has been quietly firm on a very narrow market whilst waiting for Mr. Kaunda to reveal his master plan. In fact, Mr. Kaunda has now returned to Lusaka and the details of his plan are still unknown, but is interesting to note that Mr. Murenda, a leader of the Northern Rhodesian African National Congress, has urged the Copperbelt mineworkers to avoid politics and political strikes. Has Mr. Murenda made this warning with an advance knowledge of Mr. Kaunda's plans?

Tins have been a very firm section throughout the week. The East appear to have changed from being small sellers to small buyers and stimulated by the persistently firm metal price would-be profit takers in London were discouraged from entering the market as sellers. In London, the cash price for the metal reached an eight-year high at £941 and with the contango at £10 the market clearly expects the rise to continue. Improvements were reflected throughout the whole range of stocks, though the features were Tronoh, which advanced 5s. 6d. to 77s., and Ayer Hitam and Gopeng, both of which advanced 3s to 57s. and 47s. 6d. respectively. Pahang rose 1s. to 18s. 9d., whilst bullish hopes about the current year's earnings prospects prompted another advance of 1s. to 26s. 6d. in Geevor. The finance houses reflected these general advances and London Tin added 6d. to 20s.

The brighter atmosphere in the Kaffir market last week following the United States demand for Freguls and De Beers has not been maintained and recently there has been very little sign of any American support. Monday was a very slack day and prices drifted slightly lower but the market was so limited that few of the quotations were actually tested. Since Monday a quiet firmness has been the keynote of Kaffirs, despite the lack of any lead from Johannesburg and with continental centres still closed the firmness has continued and appears to be the result of limited demand in London. General Mining were marked up by more than 3s. to 82s. 6d. and over the week Anglo American have risen almost 4s. to 126s. 3d.

Some of the older South African gold mines strengthened including Daggafontein to 18s. 3d. and Durban Roodepoort to 25s. 7½d. Sallies also gained, to 13s. 9d. These gains on London have not been fully reflected in Johannesburg and the discount margin in these older shares has fallen lower and is now standing at less than 17 per cent.

Elsewhere, San Francisco have risen almost 2s. to 20s., apparently in response to the Mexicanization plans. This is the best that Friscos have reached this year. A small buying order has been sufficient to put St. John d'el Rey up by 7s. 6d. to 98s. 9d.

Obituary

JAMES D. WOLFF

On the morning of Thursday, August 10, 1961, members of the Metal Exchange and a far wider circle in the non-ferrous metal trade of this country and abroad were saddened by the news of the death of Mr. James D. Wolff in his eighty-fifth year.

Mr. Wolff, who was senior partner in the firm of Rudolf Wolff & Co., became an authorized clerk on the London Metal Exchange in 1904 and in 1923 was elected a member of the Committee. From that time on his influence on the evolution of the Exchange will leave a permanent impression as he continued as a member of the Committee until 1950 and was chairman from 1928 to 1943 and from 1944 to 1950. In 1928 he was elected to the Board of the Metal Market and Exchange Co. Ltd., and was its vice-chairman from 1936 to 1946 and chairman from 1946 until June of this year, when he retired after seeing the re-building of the interior of the Exchange in Whittington Avenue and having made certain that the position of the London Metal Exchange as the premier market in the world had been firmly re-established.

Although his services to the Exchange were of great value during the years preceding the outbreak of the second World War, his greatest achievements lie in his successful efforts to keep members of the Exchange in contact with one another during the war years, and in those years subsequent to the war during which the market remained closed, and in the part he played in the re-opening of the tin market in 1949 and of the lead, zinc and copper markets in 1952 and 1953. Mr. Wolff led the London Metal Exchange delegation when it gave evidence before the Bovenschen Committee in connection with the re-opening of the metal markets and when the government decided in 1949 to permit dealings in tin to recommence he was appointed government broker, an appointment to which he brought his great experience of the market which enabled him to carry out the job to the satisfaction of both the Ministry and the metal trade.

Subsequently, his advice was much sought after in the difficult negotiations preceding the opening of the other three markets and after full trading was re-established all members of the market were able to approach him as a friend and an adviser, being certain that he would not spare himself in studying any problem brought to him.

The fact that daily trading takes place on the L.M.E. at all after the long years of inactivity is his lasting memorial.

Board Changes

Sir George Harvie-Watt, Bart., chairman of The Consolidated Gold Fields of South Africa, Ltd., has joined the board of American Zinc, Lead and Smelting Co. The appointment follows the announcement last May, of a Joint Venture Agreement between Tri-State Zinc, Inc. (a wholly-owned subsidiary of Gold Fields Mining and Industrial Limited) and American Zinc, to mine and mill zinc ore deposits near New Market, Tennessee.

*

Rand Mines Ltd. announces that Mr. E. G. Long-Innes, has been appointed a manager of the company with effect from August 9, 1961.

INDIAN COPPER CORPORATION

A SUCCESSFUL YEAR'S OPERATIONS

MR. PATRICK E. G. W. PARISH ON NEED TO HUSBAND RESOURCES

The 37th annual general meeting of Indian Copper Corporation Limited was held on August 9 in Calcutta.

Mr. Patrick E. G. W. Parish, O.B.E. (the Chairman), presided, and in the course of his speech said :

Production of Copper in 1960 was 8,769.30 long tons, which is a record for the Company and 1,216 long tons higher than last year.

Besides mining, producing and rolling Copper, your Company rolls Brass and Yellow Metal Sheets and Circles. This requires a mixture of Copper and Zinc, of which the latter metal has to be imported. During 1960 sufficient import licences were issued by Government to maintain supplies of our requirements, but I must tell you that in 1961, owing to the serious foreign exchange position, we have not been able to obtain our full quota of Zinc with the result that output has been adversely affected in recent months and there are little prospects of any improvement at present.

Active prospecting throughout the property has continued during the year and although no startling discoveries have been made, your new small mine at Surda is contributing towards our efforts to increase production. Prospecting, as you well know, is a very expensive business, but it is essential for the future of the Company and is vital if we are to increase production of this metal with a view to reducing the amount of Copper which has to be imported and thus save valuable foreign exchange.

Ore reserves increased by 88,695 short tons and at the end of the year stood at 4,292,242 short tons, which is a sound and satisfactory position for a Company mining deep copper ore deposits.

Despatches of finished products, which have a direct relationship to profits, were maintained at a satisfactory level in 1960, but this year, owing to transport difficulties, heavy stocks have accumulated at the Works. However, provided the required number of wagons from the Railway are forthcoming, the shortfall in despatches can be made good.

The satisfactory financial result for 1960 is due to higher output and a reasonable and stable World copper price level. Expenses, however, continue to rise partly as a result of increased labour costs and partly because we are now mining at greater depths. I think, however, you will agree that the Company has had a successful year in 1960.

Last year I outlined the additional plant and machinery that will be required during the next few years for the processing of the expected increased output of ore from the Mine. Although investigations concerning the most suitable and up-to-date equipment have not as yet been finalized, I am pleased to report that a start has been made by the completion of modifications to the Aerial Ropeway to carry the anticipated output from the Mine to the Works.

It is pleasing to report that on the whole relations with labour have been satisfactory. In November 1960 a settlement was reached with the joint Mines and Works Unions increasing basic pay and Dearness Allowance, which has been favourably received.

Kyanite : Although we cannot assist in the country's export drive so far as our Copper is concerned, our efforts do help to conserve considerable sums of foreign exchange which would otherwise have to be spent on importing copper. On the other hand, the export of Kyanite is a useful foreign exchange earner and we are doing our best to increase sales abroad. Despatches abroad during 1960 amounted to 21,242 long tons.

Electrolytic Project : Work has now started on the foundations of the new buildings and satisfactory progress made on the ordering of equipment. At the moment we are delayed by the shortage of cement, which is chronic throughout the country, but it is hoped that this will not prevent completion of the Project on schedule.

Accounts

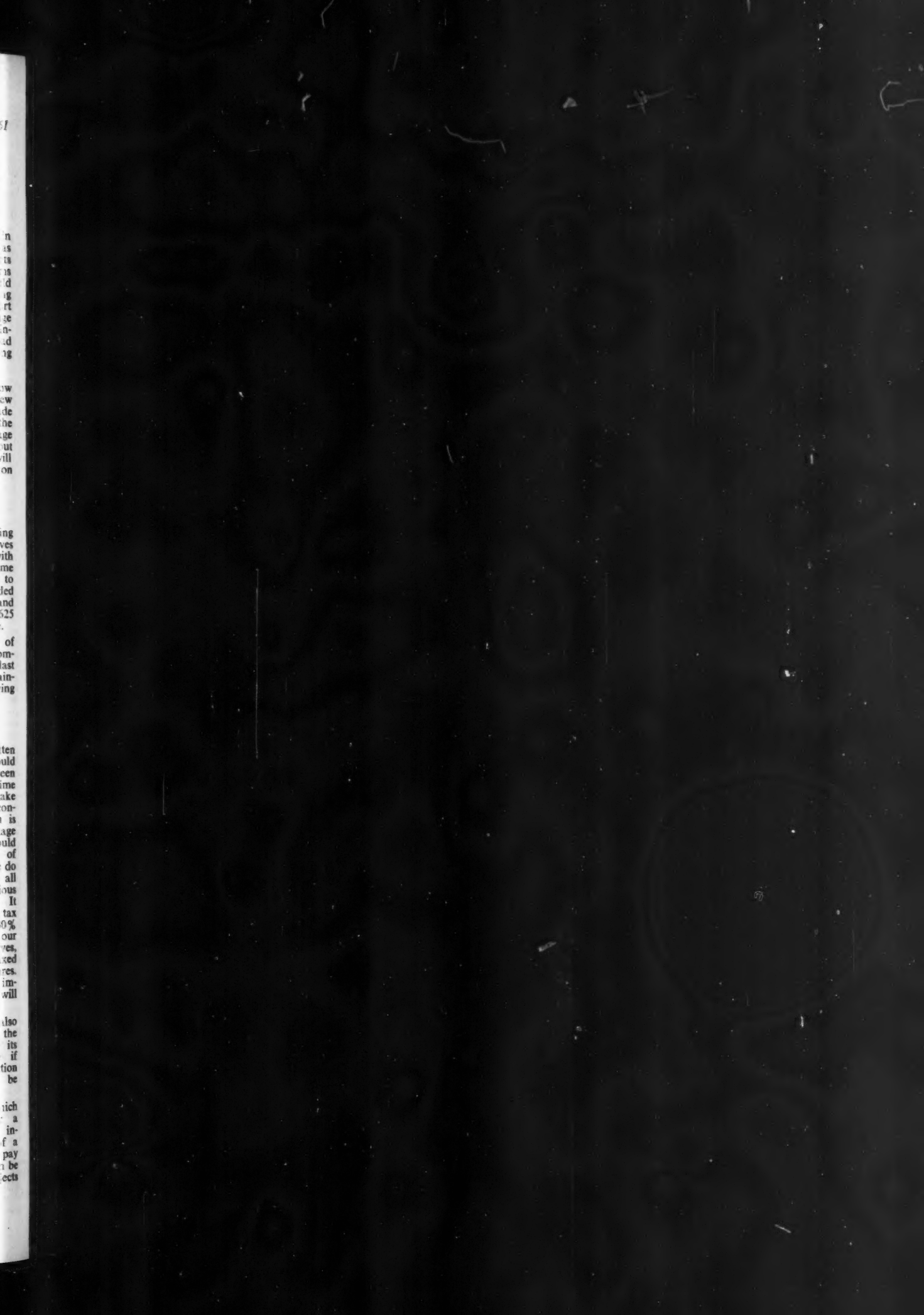
The Profit for the year before providing for Taxation, Depreciation and Reserves amounts to £1,307,982 as compared with a profit in 1959 of £1,202,259. Income Tax and Super Tax on profits amount to £500,477. Your Directors have decided to place £175,000 to Depreciation and £200,000 to General Reserve. £50,625 goes to Development Rebate Reserve.

There is a balance available of £489,001 and your Directors are recommending that the same Dividend as last year, i.e. 27% subject to tax, be maintained, absorbing £370,251, leaving £118,750 to be carried forward.

Bonus Share Issue

A number of Shareholders have written to us suggesting that the Company should issue Bonus Shares and there have been rumours in the market from time to time that your Directors were about to make such an issue. We have, of course, considered this matter, but our opinion is that for the present there is no advantage in so doing. On the contrary, it would involve the Company in paying tax of 12½% on the Bonus Shares, which we do not think is justified as we require all the money we have got for the various expansion plans which lie before us. It is true that in this year's Budget the tax on Bonus Shares was reduced from 30% to 12½%, but even this tax is, in our opinion, unreasonable when Reserves, which have been built up out of taxed profits, are converted into Bonus Shares. Let us rather conserve our funds for improvements and extensions which will earn increased profits in the future.

The matter of a Rights Issue has also been discussed by your Directors, but the Company has sufficient cash for its immediate plans. In due course if further funds are required the question of making a Rights Issue will again be considered.

I am fully aware of the reasons which prompt Shareholders to hope for a Bonus Issue, but unless profits are increased there can be no benefit of a better yield and, as I have said, to pay out 12½% in tax when the money can be profitably used in extension projects seems to us unjustifiable.

The report was adopted.